Vol. 16 July - December, 2021 No. 2

ABSTRACTED IN CABI, U.K., SHIMAGO, CROSS REF, INDIAN CITATION INDEX AND GOOGLE SCHOLAR, PUBLONS, CITEFACTOR

Journal of Natural Resource And Development

(Peer Reviewed, Refereed Research Journal of Agriculture and Science)

Abbreviated title of Journal : *Jour. Nat. Res. Dev.*

NAAS RATING : 3.77

online @ www.sbsrd.org

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10/96, Gola Bazar, New Jhusi, Prayagra) - 211 019 (U.P.), INDIA

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Journal of Natural Resource and Development 16 (2) 1-13, 2021 | NAAS RATING : 3.77 | ISSN-0974-5033

STATUS OF SEA BASS FARMING IN THE COASTAL AREA OF BANGLADESH

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Received : 15.05.2021 Accepted : 15.06.2021

ABSTRACT

The study on culture of sea bass (Lates calcarifer, Bloch 1790) was carried out to evaluate the potential of culturing sea bass in the coastal area of Bangladesh. Sea bass culture technology is totally depended on traditional method. The culture areas are Satkhira-Khulna-Bagerhat, Patuakhali-Barisal-Barguna and Madaripur-Faridpur-Magura. A group of interested people collected sea bass fry from the river of Payra, Andhermaik, Biskkhali, Taksialy, Vodra, Gangri, Ichamoti, Khulpatua River and also chingree gher, and sold the fry to the seas bass farmer for culture. The farmer cultured sea bass species by biological management using fry of different species specially tilapia as a feed. Sea bass culture technology is needed to be promoted by hatchery management, appropriate pre-stocking, stocking, and post stocking management technology. Selective breeding grounds of sea bass in the different area of coastal region should be declared as a fish sanctuary, and Fish act and rule need to be amended to restrict catch of under sized fry for a certain period. A sea bass hatchery and demo farms with a nursery should be established for sustainable aquaculture practice. An effective training package is also needed to develop and offer to the farmers.

Keywords : *Sea bass, coastal area, biological management, value chain, economics, training.*

INTRODUCTION

Sea bass (Lates calcarifer) (Bloch) is a brackish water fish. It is locally called as *Coral or Vetki* in Bangladesh. *Sea bass* is a commercially important euryhaline fish of the Indian sub-continent and it grows to a comparatively large size with delicate, flovoured flesh and commands high price in the markets (Barlow and Rimmer 1993). It can be reared both in freshwater, brackish water and seawater conditions (Bardach et al. 1972). There are many practical advantages for promoting this species in culture practices in Bangladesh. Some important aims are good taste and bone less, delicate, flavoured flesh, Scope for culture in inland, coastal and marine waters, high local market trade among the coastal fishes of Bangladesh, better

market price, wide consumption in sea food restaurants and other high rating hotels, more focused and Stable supply chain and higher international export potentials (BFFEA, 2012; Brown, 1977; Edward and Asmin, 1986; Gammanpilai and Singappuli, 2012).

FAO (2006) reports that total farmed sea bass production is expected to grow a further 5% to 7% and although there is evidence that aggregate market demand have increased. Product ranges for bass and bream are becoming significantly more modernized and diverse, with more emphasis on preparation, portioning and packaging. Eco-labeling and organic certification is also increasing prevalent.

Sea bass is consumed mainly by local consumers and are transported to Dhaka, Chittagong and Sylhet cities. The acceptability and demand of Sea bass is increasing in local market. In Satkhira Indian importers come to local arots and import Sea bass, Mullet, Pabda and other fishes (Monwar et al. 2013). Ecofriendly technology on integrated tilapia-sea bass polyculture may be treated as a milestone in the brackish water aquaculture in Bangladesh (Monwar*et. al.,* 2013). Utilization of vast unutilized or underutilized derelict coastal areas, low cost but profitable and quick return on the investment, easy **tech** and risk-covered in comparison to shrimp culture, eco-friendly affordable environmentally sustainable technology and employment opportunity for the marginal farmers. Sea bass can be cultured in a variety of culture systems using marine water, brackish water and freshwater (Harpaza *et al.,* 2005; FAO, 2006; Tengk, 1986). In traditional brackish water culture, wild shrimps, sea bass fry and others usually enter the culture ponds during water filling (Schuster 1950; Brown 1977). Growth of wild sea bass in the mixed culture pond is relatively fast.

The Asian sea bass industry is also getting newer heights in East Asian countries and India having preferment from the government. The Ministry of Agriculture and Farmers' Welfare of India has issued its final guidelines, allowing private entrepreneurs and enterprises to import Asian Sea bass fish (*Lates calcarifer*) seed and fingerlings. However, aqua enterprises are keen on importing Asian Sea bass from Australia, a leading country that has developed (Jerome, 1981).

Depending on demand and good economics of sea bass fish, a sustainable aquaculture practice should be developed in the selective areas of coastal region. Selective breeding grounds of sea bass in the different area of Ichamoti, Khulpatua, Vodra, Gangri, Taksiali, Payra, Biskatali, Andhermanik river may be declared as a fish sanctuary, and Fish act and rules need to be amended to restrict catch of under sized fry for a certain period. A model sea bass hatchery and model demo farm with a nursery should be established for sustainable aquaculture practice. Supply of various types of inputs should be ensured at appropriate costs, which can easy the expansion of sea bass farming in Bangladesh.

MATERIALS AND METHODS

Study area

The current survey was conducted in five selected districts, namely Satkhira, Khulna, Bagherhat, Patuakhali and Barguna to collect information about sea bass culture and management issues.

Study period

Study on cultural practices of sea bass was conducted in the month of December, 2018 in the selected coastal areas to collect primary data by direct interviews with individual respondents.

Rationale behind selection of the study area

About 100% seabass spawn of the country is collected from the Ichamoti, Khulpatua, Vodra, Gangri, Taksiali, Payra, Biskatali and Andhermanik Rivers of southern coastal region of Bangladesh.

There is no sea bass hatchery in Bangladesh. Therefore, current sea bass culture is practiced depending on natural researces limited to the districts of Satkhira, Khulna, Bagherhat, Barguna, Patuakhali. Considering the above mentioned reality and potentiality, these five districts were selected as study areas. A list of sea bass culture farmers as interviewed during the visit by FGD and KII.

Data collection procedures

Primary data was collected by direct interviews by questionnaire survey, FGD and KII. During the visit 08 FGDs and personal communication methods were being followed (Figs.1-3), with structured questionnaire to get response from the farmers. Questions were asked systematically, with framed questionnaire. Necessary explanations about questionnaire were given to the sea bass farm owners who were interviewed wherever it was felt necessary. Alongside with sea bass farm owners, transporters and paikers were also met, to get more information about needs and gaps of the field.

Fig.1: FGD of Asasuni, Satkhira.

Fig.2: FGD of Debhata, Satkhira.

Fig. 3: FGD of Dumuria, Khulna

Secondary data were collected mainly from the Department of Fisheries (DoF). Relevant literature has been reviewed and internet sites were explored to have relevant information. Fish producers, Transporters and Paikers were also met alongside with sea bass farm owners, to get more information about needs and gaps of the field.

Analysis of experimental data

The data were analyzed through one way ANOVA using SPSS program to find out whether any significant difference existed among different data (Duncan 1955; Zar 1984). Standard deviation in each parameter was calculated and expressed as mean ±S.D.

RESULTS AND DISCUSSION

1. Culture practices of Sea bass

The year of culture practice of the surveyed about sea bass aquaculture ranged from 1999 to 2003, 2004 to 2008, 2009 to 2013 and 2014 to 2018, respectively. Sea bass culture in the surveyed area was practiced at 13.41% in 1999-2003, 26.83% in 2004-2008, 50.0% in 2009-2013 and 100% in 2014-2018 (Table 2).

Table - 2 : Sea bass culture practice in different years of Bangladesh.

Practicing Year	Polyculture of Sea bass Number (n)	Percentage (%)
1999-2003	11±2.22	13.41
2004-2008	22±4.44	26.83
2009-2013	41±6.07	50.0
2014-2018	82±8.75	100

2. Occupation of the sea bass farmers

The occupation of the Sea bass farmer is divided into four types (Table 3). The first type was aquaculture business only, second type was aquaculture and service, third type was aquaculture and agriculture and fourth type was aquaculture and others. Among the surveyed 82 sea bass farm owners, 53.66% earn their livelihood from only the aquaculture business and 19.51% was involved with service, 21.95% was involved with agriculture and other 4.88% involved with others.

Table - 3 : Occupation status of the sea bass Farmer of the survey area.

Type of occupation	Number of different Fish farmer		Total Farmer (n)	Percentage (%)	Cumulative %
	Polyculture (n)	Monoculture (n)			
Only aquaculture business	43±8.11	01±0.0	44±10.44	53.66	53.66
Aquaculture + Service	16±2.07	00	16±2.07	19.51	73.17
Aquaculture + Agriculture	18±2.22	00	18±2.22	21.95	96.33
Hatchery + Others	04±0.04	00	04±0.04	4.88	100

It is observed that the farm owners who have been particularly involved in aquaculture business can provide required time to monitor the ongoing activities of the aquaculture farming. Others who have similar professions (e.g., Agriculture) also pay their attention to the farm management by their own. But the farm owners who are service holders or have other business (like small trading, grocery shops, rice boilers etc.) cannot provide much time. In such cases dependency on technicians become obvious, this affects the management, quality and financial status of the farm.

3. Educational status

The educational status of manpower of the farm owners of the surveyed areas is presented in table 4. About 13.41% of the total manpower of the 82 private farm owners were lower level but had the ability of signature. About 50.00% of the manpower had primary and high school education respectively. About 25.0 % manpower of the different farms had SSC to HSC level and finally 11.59% of the manpower had graduate to master's level education (Table 4).

Table - 4 : Educational status of the manpower of the farm owners of the surveyed area.

Educational status	Responded fish farmer (n)	Percentage (%)	Cumulative (%)	Remarks
Lower level	22±2.28	13.41	13.41	Only ability to sign
Mid level	82±3.17	50.0	63.41	Primary to High school education
Under Graduate level	41±1.06	25.0	88.41	SSC to HSC
Graduate level	19±0.82	11.59	100	Graduate to Master's

It is observed that about 11.59% of the farm owner's has graduation degree. In all the cases, management of sea bass culture was much betters for higher educated farmers than others. It seems relevant to mention that primary targeting these educated people may positively support further development of sea bass culture industry.

4. Information about Sea bass farm owners

Information about sea bass farm owners is presented in the table 5. Out of 82 Farm owners 9.76% had highest farm area 0.36-0.45 ha, 17.07% had 0.26-0.35 ha, 24.39% had 0.16-0.25 % and 48.78% had 0.06-0.15 ha.

Table - 5 : Culture area (ha) of sea bass farm in the studied area.

Farm area (ha)	Responded farmers (n)	Percentage (%)	Remarks
0.06-0.15	40±4.41	48.78	Maximum sea bass farm owner area is 48.78%.
0.16-0.25	20±2.88	24.39	
0.26-0.35	14±1.11	17.07	
0.36-0.45	08±0.77	9.76	

It is observed that sea bass farm owners are practicing 0.06-0.15 ha area farm in the gher or ponds due to poor knowledge of sea bass aquaculture management. Therefore, it is anticipated un-trained sea bass farm owners should be trained for sustainable aquaculture development.

5. Information about farm management of sea bass farmer

Information about farm management of sea bass farmers presented in the table 6. Out of 82 farm owners 84.15% said that occasionally they used saline water during tide and sometime they used pump machine to supply water. About 95.12% said that they used ziolite and lime, cowdung and mustard oil cake.

Table - 6 : Farm management technique of sea bass in the studied area

Management indicator	Responded farmers (n)	Percentage (%)	Remarks
Water treatment process	69±9.66	84.15	Poor knowledge on culture and management
Fertilizer and Chemical used	78±10.55	95.12	

Sea bass farm owners are practicing traditional method for water treatment, and fertilizer and chemical application. Therefore, sea bass farm owners should need appropriate training on the improved management and culture techniques.

6. Information about sources of sea bass fry

Information about sources of sea bass fry is presented in the table 7. Out of 82 farm owners 86.59% said that the sources of sea bass fry is Payra, Andhermaik, Biskkhali, Taksialy, Vodra, Gangri, Ichamoti, Khulpatua River. According to 13.41% farmer said that Chingree gher is also a reservoir of sea bass fry.

Table - 7 : Sources of sea bass fry in the coastal area.

Sources	Responded farmers (n)	Percentage (%)	Remarks
Different river of coastal area	71±10.18	86.59	The source of sea bass fry is Payra, Andermaik, Biskkhali, Taksialy, Vodra, Gangri, Ichamoti, Khulpatua River and gher.
Chingri gher	11±1.11	13.41	

Sources of sea bass fry are very important. Breeding of sea bass in different designated areas of the rivers should be declared as a Sanctuary.

7. Information about age of sea bass fry

Information about releasing age of sea bass fry is presented in the table 9. Out of 82 farm owners 74.39% assumed the age of 50 g size fry is 60 days, 51-100 g size fry 60-100 days, 101-150 g size fry 101-160 days and151-200 g size fry is 161-210 days. Actually there is no study on the age of fry.

Table - 9 : Age of sea bass fry in the studied area.

Size (Weight in g)	Prediction of age (days)	Responded farmers (n)	Percentage (%)	Remarks
< 50	< 60	61	74.39	101 to 160 days age fry is preferred to release by farmer.
51-100	61-100	68	82.93	
101-150	101-160	81	98.78	
151-200	161-210	72	87.80	

It is observed that there is no nursery of sea bass fry in the coastal area. Natural nursery management should be practiced in the coastal area until establishment of sea bass hatchery. The spawn should be collected from the breeding ground of the different river and reared around two months. About 101-150 g size fry is preferred by the farmer because of quick growth in the pond (Maneewongsa et al., 1984; Chogalel et al., 2015). It is strongly recommended that a standard stocking rate, desirable age and size of sea bass fry should be developed for appropriate stocking management.

8. Water quality of ponds

Table 10 shows the water and soil quality conditions of the ponds. About 63.41% farm owners had shallow knowledge about water and soil qualities of their farm. About 25.61% farm owner mentioned as moderately satisfactory and 10.98% farm owner mentioned as satisfactory.

Table - 10 : Knowledge profile of the water and soil qualities of sea bass ponds.

Characteristic	Total hatcheries (n)	Percentage (%)
Shallow knowledge	52±6.01	63.41
Moderate	21±2.61	25.61
Satisfactory	09±0.88	10.98

But in Allarchor Chingri Chas Prodorsoni Khamar (Govt.) water quality parameters were studied (Boyd, 1982). The table 11 is given bellow:

Table - 11 : Mean values (±SE) of water quality parameters during culture period of sea bass.

Parameter	Data
Water Temperature (0C)	29.3±3.01
Water Depth (cm)	302±9.82
Salinity (‰)	10.04±6.54
pH	7.85±0.55
Dissolved Oxygen (mg l^{-1})	4.80±1.11

Almost all the farm owners and manpower of the farm under study area had shallow knowledge on water quality parameters, which are vital part of proper farm management. So, appropriate training

package must be developed that includes the water quality management in farms.

9. **Feeding practice of the sea bass culture**

In Bangladesh Sea bass feeds on live food, such as small Tilapia, Silver Carp, Harina Chingri and other trash fish. Feeding practice of the sea bass culture in the survey area is presented in the table 12. About 93.90% fish farmer of the surveyed area disagreed about the feed of supplementary feeds (pellet feed). Only 6.10% of the farmer agreed sea bass take pilled feed in nursery stage (Kamruzzaman, *et. al.* 2013).

Table - 12 : Feeding practice of the sea bass culture in the survey area

Type of feed	Total Farmer (n)	Percentage (%)	Cumulative %	Remarks
Live feed	77±9.21	93.90	93.90	No one agreed sea bass feed pellet feed.
Supplementary feeds (Pellet feed)	05±1.33	6.10	100	In nursery level the fish take nursery feed.

It is observed that no one farmer agreed to take pellet feed in the culture level (Wongsomnuk and Manevonk 1973). This is may be due to traditional practices and availability of live feed which are cheaper than pellet feed. Therefore, further study may be conducted to standardize dose of supplementary feed application rate in the culture practices, starting from nursery to rearing level.

10. Transportation facilities

During investigation it was observed that about 70% farm owners had no transportation facilities of their own. The farmer hired pick up vans even manually operated vans for sea bass fish transportation. Transportation should be developed for this community people.

11. Marketing Chain

Faria: The small-scale traders who visit small farms at the time of harvest are known as *Faria*. They purchase, transport and sell small volumes of fish directly or indirectly (through an *aratdar*) to depots or *paiker*. Traditionally, *faria* tended to offer credit payments to the farmers. More recently, in order to secure supply, *faria* also offer cash payments to farmers.

Aratdar: Arat are privately owned auction places where the owner rents out space to *aratdar* who facilitate the auctioning process. Paiker and depots purchase raw materials through aratdar. Arat mostly consist of a cluster of small shops in concrete sheds in the open air or a cluster of small shops in an indoor auction hall. The aratdar are equipped with iron tables, plastic crates, and traditional (cata) weighing equipment. Arat can vary in size. The smallest ones observed have only 4 or 5 aratdar inside their premises, while the largest can have more than 50.

Paiker: Paiker are wholesalers who operate with a license but without a shop. They purchase fish from aratdar and depots and transport and sell it to factories through account holders. The account holder will take a commission from the paiker for using his account. Paiker mostly purchase fish at the arat but also purchase from smaller depots that do not have their own means of transport. Paiker also regularly do pre-processing activities for the factories.

Retailers: Retailers purchase fishes from the aratdars and paikers and sell to the customers. It is evident that many producers directly shift their products to arat and retail markets to sell to customers directly.

About 12.20% farm owners reported that they were interested sell fish directly to Faria, 63.41% sea bass

farmer were interested to go Arot directly for selling fish, 14.63% went paiker to sell the fish and finally 9.76% farmer sell to the retailer (Table 13).

Table - 13 : Pattern of communication facilities in the studied area.

Pattern of communication	Total Farmer (n)	Percentage (%)	Cumulative (%)	Remarks
Faria	10±1.80	12.20	12.20	Farmers are interested to go Arot directly.
Aratder	52±6.82	63.41	75.61	
Paiker	12±3.88	14.63	90.24	
Retailer	08±1.80	9.76	100	

It was a notable observation that the farmers are interested to go arotder directly to sell the fish. Another observation was that some business men of India came to Satkhira and Khulna region to buy sea bass fish from the different markets. They bought the fish by L.C System and exported to West Bengal India. Therefore, a partnership with West Bengal business communities may be developed to create an enabling environment for improving the future marketing system of this species.

12. Communication facilities of sea bass farm

The communication facilities of surveyed fish farm are shown in table 14. About 42.68% fish farmer mentioned the facility was not good in position due to narrow road. About 25.61% mentioned as good, while 31.71% owners mentioned the facility as excellent i.e. they are satisfied for existing communication facility.

Table - 14 : Communication facilities of the fish farm of the studied area.

Pattern of communication	Total Farmer (n)	Percentage (%)	Cumulative (%)
Not good	35±4.20	42.68	42.68
Good	21±3.41	25.61	68.29
Excellent	26±3.88	31.71	100.0

13. Source of funds for sea bass culture

About 37.80% of owners had funds for sea bass production from their own sources. About 24.39% and 20.73% of owners got their funds as a loan from relatives and friends, and from banks respectively. During survey period it was observed that about 12.20% farm owners got their loan from NGOs and finally 4.88% farm owner went to Mohajon (Table 15).

Table - 15 : Source of funds for sea bass culture in the studied area.

Source of fund	No. of Farmers (n)	Percentage (%)	Cumulative (%)
Self	31±3.44	37.80	37.80
Self+ Friends+ Relatives	20±2.01	24.39	62.19
Bank	17±1.99	20.73	82.92
Self+NGO	10±1.88	12.20	95.12
Mohajons	04±1.01	4.88	100.0

14. Occurrence of fish disease in hatcheries

About 25.61% hatchery owners reported that there were no fish disease problems in their farms, while 54.88% owners reported that there was occasional attack of fish disease (Table 16). About 19.51% owners reported that disease was out broken in every year. It was a remarkable observation that the disease of fishes was controlled by treatment in the survey period.

Table - 16 : Occurrence of fish disease in the sea bass culture area.

Category of occurrence of fish disease	Total fish farm (n)	Percentage (%)	Remarks
No disease	21±2.15	25.61	
Seldom attack	45±4.73	54.88	Epizootic Ulcerative Syndrome and Shut rug attacks every year.
Every year attack	16±1.58	19.51	

15. Training status of sea bass farm owners

Most of the sea bass farmers mentioned that there is no training offered by GOB or others on sea bass culture management including nursery and disease. It was observed that educated hatchery owners were mostly invited to participate in the training programs and workshops of DoF and BFRI or NGOs and majority of the higher educated farm owners were reluctant to take advice/suggestions from DoF/BFRI or other organizations. However, appropriate training package is essential to develop for sea bass industry.

16. Economics of sea bass Farming

During Focus group discussion the sea bass farmers gave information on cost and return of one hectare area of sea bass culture (Table 21).

Table - 21 : Cost and return of sea bass fish production in one hectare area under a polyculture management with bagda over a period of 300 days.

Item	Amount TK.ha^{-1}.day^{-300}	Remarks
Total production	1365 kg	495.06/kg
Total return (TR)	675750	Price related with size and weight
a. Variable cost: 1. Price of fingerlings	49400	
2. Feed (Live)	122491	(Tk. 30.00 kg^{-1})
3. Fertilizer/Chemical	10369	
4. Human labor cost	50000	(Tk. 5000.00 month^{-1})
6. Miscellaneous	10000	
Total Variable cost (TVC)	242260	
b. Fixed cost : 1.Pond rental value	24700	Tk. 100.00 dec.$^{-1}$ according to local rate
2.Interest of operating capital	24226	10% interest according to BKB, Bangladesh
Total fixed cost (TFC)	48926	
Total cost (TC= TVC+TFC)	291186	
Net return (TR-TC)	388564	

BKB= Bangladesh Krishi (Agricultural) Bank

Economics of Sea bass Farming is estimated based on the collected data during the study, average over 19 farms (Brown, 1977; Rahaman *et al*., 2013 and Chakraborty, 2020). There is no actual economic data on sea bass culture. Culture system is also running with ITK technology. So, it is essential to run sea bass culture in the coastal region of Bangladesh with semi intensification (SI) method. After having introduction of practices, data is needed to collect for a good economic analysis, which is currently not available.

17. The value chain approach

Functions, actors and their Roles in value chain

1. *Collection of wild fry:* Sea bass fry supply largely depends on wild source. Natural fry are commercially available from last 2/3 years. Ichamati, Betna, Kabodhak and Kholpetua rivers are the main sources of wild fry.
2. *Fry Trading:* Wild fry collectors sell their collected fry to sea bass farmer and the local accumulators are belong to mainly in Satkhira, Khulna, Bagerhat, Patuakhali and Borguna area. These accumulators send wild fry to the Paikers. Some of the fry seller (arots or whole sellers) are located in Asasuni, syamnagor, Kaliganj, Morolganj, Koira upazilas. Fry Traders buy fry from these arots and sell also to the sea bass farmers. The average size of those fry is 2-3 cm and price is TK 1.00-2.00 per piece. Sea bass fry mortality is very low (0.50%) compared to shrimp and other white fishes.
3. *Grow-out farming:* The farmer stocks fry at different sizes in the farm. It takes about one to three months depending on size (Maneewongsa and Ruangpanit 1984a). Bigger sizes fry are high market value (Table 23). Some farmers collect sea bass fry from their own shrimp farm and culture in a separate pond or sold the fry to other farmers.

Table - 23 : Size and price composition of sea bass fry.

Size (cm)	Grow out time	Market price (TK/piece)	Remarks
1-2	1-2 week	>5.00	Collected directly from nature during April-July and nursery pond
3-4	2-3weeks	8.00-10.00	
5-7	3-5 weeks	15.00-25.00	
8-10	5-6 weeks	30.00-40.00	Collected from nursery, shrimp farm (Gher) and nature
11-12	7-8 weeks	41.00-50.00	
13-14	9-15 weeks	51.00-60.00	

18. Input Supply

The sea bass farming are mostly done in extensive method and based on polyculture with shrimp, prawn, whitefish and tilapia. There are some monoculture practice have been observed during the study period. In monoculture some farmers prepared pond by using lime, urea and TSP. The highest concentrations of input retailers are located in Bagerhat and Satkhira districts. Apart from supplying inputs, the input retailers also provide information on use of feed and aqua-chemicals as embedded service.

Sea bass feed on live food, such as fry of tilapia, silver carp and harina chingri. Live and 'trash' fish are still used as a feed because it is cheaper in these areas and more available than pellet diets. Tilapia is stocked in the pond as a live feed of sea bass in the grow out pond before stocking sea bass

fry. Some farmers have used pellet feed in the sea bass nursery pond. Although the sea bass fry can feed on pellet/formulated feed, once sea bass become grown up to a bigger size, they don't take pellet feed (Kamruzzaman, *et. al.* 2013; Chogalel, et al., 2015). The feed is available in the local market which is not categorically prepared for sea bass. As currently there is almost no practice of pellet feeding, standardization of the diet is yet to be developed.

From the recent study, it became evident that two regions are better for promotion and intensification of sea bass culture, (a) Satkhira-Khulna-Bagerhat and (b) Patuakhali-Barguna-Barisal. Most successful production was observed in poly-culture with shrimp and tilapia. However, the following paragraphs depict the prospects and present situation in the three coastal regions of Bangladesh:

1. Satkhira-Khulna-Bagerhat: This region has access to both brackish and fresh water. The lower part (Satkhira) is mostly brackish water zone and the upper part (Khulna-Bagerhat) is mostly fresh water zone. Satkhira is suitable for sea-bass culture because of presence of saline water. Sea-bass fry and juvenile is easily available from marine sources. On the other hand, suitability of Khulna-Bagerhat is lesser as there's no breeding zone in the perimeter. Presence of mildly saline water is the advantage of this region.
2. Patuakhali-Barisal-Barguna: Two key factors that make this region suitable for sea-bass farming /culture are presence of both brackish water and the estuaries. These estuaries are breeding ground of sea-bass and large source of natural fry. Commercial fry catchers are also located in these regions, particularly in Kuakata. Also, due to the existence of suitable level (0-15 ppt) of brackish water in major part of the region, both sea-bass and tilapia culture is found to be favorable and suitable for sea-bass and tilapia poly culture.
3. Madaripur-Faridpur-Magura: This region mostly depends on natural sea-bass fry which enters in pond/gher naturally. In absence of any estuaries; there are no breeding of sea-bass in the region. So, availability of fry is totally random and no fry catching is observed. Thus, this region may not be suitable for culture of sea-bass unless fry supply is ensured (PKSF, 2017).

CONCLUSION

The finding from the survey and discussion was used to develop the value chain and for analysis of the value added and profitability at different level of the value chain. The following recommendations are made for development of sea bass aquaculture and management in Bangladesh. A pilot project is to be initiated by the government involving the farmers' community. Acts, Rules, Policy, Strategy, Plan of Actions is needed to be reviewed to safeguard sea bass and inter-agency collaboration (e.g. Forest Department, WDB, LGED, DAE) is needed for coastal zone management. Depending on demand (delicious and less numbers of bones) and good economics of sea bass fish, a sustainable aquaculture package should be introduced in the selective areas of coastal region. Selective breeding grounds of sea bass in the different area of Ichamoti, Khulpatua, Vodra, Gangri, Taksiali, Payra, Biskatali, Andhermanik river should be declared as a fish sanctuary, and fish act and rules need to be amended to restrict catch of under sized fry for a certain period. A model sea bass hatchery should be established in a suitable location and a model demo farm with a nursery to be established from Public/Private Partnership. Supplementary feed (nursery and pellet feed) should be standardized and poly culture package with Tilapia, Bagda and Parsa

in saline water and culture with carp and tilapia in fresh water should be developed. Supply of various types of inputs should be ensured at appropriate cost, which can ease the expansion of sea bass farming. Appropriate steps should be undertaken to train up interested sea bass farm owners, especially on brood management, feeding regime for brood and fry rearing, hatchery and nursery management techniques, quality hatchlings, fry and fingerling production and water quality management and fish health management/disease should be controled. Sea bass farmers would be registered, and an inventory and a data base should be developed by the government (DoF), which would facilitate a long term trade and international marketing. Cluster farming approach should be practiced by DoF for sea bass farming in Bangladesh, which will show not only more productivity and economic viability, but also a community-based social modeling would be established. This approach can be effectively introduced for sea bass farming.

ACKNOWLEDGEMENT

The authors acknowledge the moral financial support and facilities provided by employees of Solidaridad Network Asia and stakeholder of the related area for its kind support and cooperation.

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Journal of Natural Resource and Development 16 (2) 14-19, 2021 | NAAS RATING : 3.77 | ISSN-0974-5033

JUTE RETTING UNDER FREE-FLOWING WATER FOR QUALITY FIBRE PRODUCTION

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Received : 15.05.2021 Accepted : 15.06.2021

ABSTRACT

Quality jute fibre production is mainly depends on the microbial retting process of jute plant. However in present scenario,the scarcity of water bodiesis a topic of concern. Today due to climate change the scarcity of fresh water in the jute growing areas has become a major problem in jute retting. Slow moving water is considered ideal condition for Jute retting as it removes decomposed products from the site of the biochemical reactions taking place during retting process and this removal also accelerates the process. A comparative study between conventional (Stagnant water condition retting) and improved retting process (Free flowing water condition retting)was carried out for quality fibre production. The application of microbial formulation (CRIJAF Sona), reduced the retting duration in both the conditions but it took lesser time in case of free flowing water condition retting. The fibre recovery in free flowing retting method alsoincreased by 17-18% with the improvement in fibre quality (colour, lustre, fibre strength. etc.) as comparedto conventional method. The root content in conventionally retted fibre was found to be higher 10-15%than the fibre obtained from the retting process under free flowing condition (5-8%). The study also emphasizesthe physico-chemical and microbiological comparison between both the retting methods and showed a very promising outcome from the free flowing technique of jute retting. This technology can not only be used for quality fibre production but also it will reduce the environmental pollution created by the conventional method of jute retting.

Keywords: *Jute,fibre, retting, stagnant water, free flowing water.*

INTRODUCTION

Jute (*Corchorusolitorius* and *Corchoruscapsularis*) being one of the most affordable bast fibre is of great interest due to its biodegradable, recyclable and eco-friendly nature. The fibre is obtained from the bark of the jute plant. The bark consists of cellulose cemented by non-cellulosic materials such as pectin, hemicelluloses, etc. These so-called cementing agents are removed by the enzymes produced by microbes in the process of retting (Majumdar et al.,

2013).Commercial extraction of jute fibre is water based microbiological retting where jute bundles are submerged into water and subjected to decomposition of pectin, hemicelluloses, and other mucilaginous substances.

Majority of Jute farmers uses the traditional method of whole plant retting in stagnant water. After harvesting of Jute, the plants are kept in the field for about 3-5 days for defoliation. The defoliated jute bundles are transferred to the nearby retting facilities, immersed in clean or stagnant water according to the availability in natural pond, road-side ditches, sometimes in river with locally available jak materials. Conventional method hampers the fibre quality (Das et al., 2017)and pollutes the environment as it decomposes the biomass(Majumdar et.al, 2019). Moreover, nowadays the trend of dryness of river and ponds/canals during short harvesting period due to the climate change, it is difficult for the farmers to ret jute.

The ideal Jute retting process requires slow moving water(Majumdar et al., 2019). Such slow moving waterremoves decomposed products from the site of the biochemical reaction and this removal also accelerates the retting process. Fast moving water is not desirable because along with the degradation products, it also removes the causative microorganisms. In this present climatic change scenario there is scarcity of fresh water and it has become a major problem in jute retting(Ali et al., 2015). Considering the above scenario, creating an artificial retting tank with slow moving circulating water can be an alternate to traditional retting process.The technique creates circulation ofwater from corresponding chambers in such a manner that it not only can ret the jute properly but also it can filter the dead debris from the tank in regular intervals and making the water suitable for reuse. As the retting process accelerates, better quality fibre obtained.

MATERIALS AND METHODS

2.1. Location selection

The study was conducted at Dr. T. Ghosh farm of ICAR-CRIJAF, Barrackpore, situated. For comparing the jute retting process two cemented tanks were used for stagnant water retting and free flowing water retting. Retting was carried out in both the tanks and assessment was done for fibre quality as well as its effect on the environment. To get plant material for retting experiment, line sowing of jute (variety-JRO-204) has been done in the ICAR-CRIJAF field following all agronomical practices. Plant characteristic data like, plant height and basal diameter were recorded after 30, 60, 90 and 120 days after sowing. The jute crop was harvested at 120 DAS and the bundles were kept in the field for 3-4 days for leaf shredding. Same amount of green jute plants (1000 sq.m) were used for both the retting trails.

2.2. Stagnant water condition retting:

The defoliated jute bundles were immersed in the cemented retting tank with stagnant water condition in two layers applying recommended dose of microbial formulation CRIJAF Sona @ 25 kg/ha(Majumdar et al., 2013). Old cement bags filled with sand/soil were used as weight material over the jak. After completion of retting, fibre was extracted manually followed by washing in clean water and sundried.

2.3 Free flowing water condition retting:

The condition of free flowing/ re-circulation of water for retting of jute was made using a 2 hp electrical jet pump with pipe line arrangements in a concrete tank having three retting chambers. The jute bundles were retted in the tank chambers using recommended dose of microbial consortium CRIJAF Sona @ 25 kg/ha. The water circulations was made by pumping the water from buffer chamber to reservoir chamber and then free

flowing of water over the jute bundles in the retting chamber to buffer chamber. After completion of retting the fibre was extracted, washed in clean water and sundried. ***Fibre Quality Determination***

The fibre strength parameter was estimated by using electronic fibre bundle strength tester and the fibre fineness by airflow fineness method for the fibres obtained from both the retting conditions (Bhattacharya, Sengupta & Mukherjee, 2009). Lustre refers to the degree of light that is reflected from the surface of a fibre or the degree of gloss or sheen that the fibre possesses (Bandyopadhyay & Sinha, 1968). Better quality fibres possess more lustre. The lustre of fibres was determined by eye sight method. The basal region or the lower end of jute fibre sometimes left with undecomposed barky portion is called root content of fibre. Root content in terms of weight percentage was recorded by the method of Roy and Saha (2013). The appearance (color) of the dried fibre was also recorded.

2.4. Physico-chemical analysis of retting water samples

The pH of retting water sample was determined by pH cum conductivity benchtop (Thermo Scientific). The electrical conductivity (EC) of retting water was estimated using an EC meter (pH cum conductivity benchtop, Thermo Scientific) by standardizing with 0.01 N KCl, and the data was recorded at 20 °C. The total N (nitrogen) and P (phosphorus) present in retting water samples was determined by the Kjeldahl method and by using the ascorbic acid method described by Watanabe and Olsen (1965) respectively (Das et al., 2011; Singh, Chhonkar & Pandey, 1999).

2.5. Estimation of microbial activity in retting water

Retting water samples from both the tanks were serially diluted in sterile distilled water from 1 to 10 dilutions. Two different media were prepared by using 1 % pectin and 0.5% beechwoodxylan for estimating pectin and xylan degrading bacterial isolates, respectively. Bacterial count (per ml of retting water) was done by plating 100 µl of diluted sample on agar plates by the spread plate method. Further, bacterial colonies were counted using colony counter.

RESULTS AND DISCUSSION

The retting of jute under free flowing/ re-circulation was found to be completed in 12 days. Whereas, in the stagnant water cemented retting tank; it took 15 days to ret the jute completely. As the water contains more decomposed matter of retting microbes which are not flushing out timely from the retting site making the water more acidic hence lowering the retting process. There was 17-18% increase in fibre recovery with lower root content in fibre extracted under free flowing water retting as compared to conventional stagnant water retting process. The fibre obtained from free flowing retting process was golden in colour as compared to brown colour fibre obtained from stagnant retting water method. The lustre of the fibre in free flowing retting was found to be bright and shiny whereas dull fibres were observed in conventional stagnant water retting. The fibre strength of jute ranged between 23.2-27.3 g/texin free flowing retting as compared to 20.9-24.3 g/texin stagnant water retting. Longer retting duration gradually led to poor quality fibre production hence decreasing the fibre strength and vice-versa. Fibre fineness is an important characteristic of fibre quality and is found to be inversely proportional with fibre strength (Das et al., 2017). In this study it was found that the fibre fineness in free flowing retting method ranged between2.4-2.9 texthan the conventional method (2.8-3.4 tex). Proper retting always minimizes or entirely removes the root content in the fibre

whereas, improper retting increases it. Fibres obtained from free flowing retting recorded 2-3 % of root content in the obtained fibre but the resultant fibre from stagnant water retting recorded as high as 15-18% of root content. The comparative assessments of retting parameters under stagnant and free-flowing water retting conditions are given in Table 1.

Table - 1. : Comparative assessment of retting parameters under stagnant and free-flowing water retting conditions.

Quality Parameters	Retting under stagnant water condition	Retting under free-flowing water condition
Retting duration (days)	15	12
Fibre recovery (q/ha)	24.3	28.4
Fibre strength (g/tex)	20.9-24.3	23.2-27.3
Fibre fineness (tex)	2.8-3.4	2.4-2.9
Fibre colour	Brown	Golden
Root content (%)	15-18	02-03
Lustre	Dull	Bright

Higher colony forming unit (cfu) is recorded in the retting water sample of free flowing retting tank as compared to the retting water samples collected from stagnant water retting tank. The retting water in free flowing retting tank contains higher pectin and xylan degraders as compared to the retting water in conventional stagnant retting tank (Das et al., 2015). The higher pectin and xylandegrader in retting water of free flowing retting tank was because of high colony forming unit (cfu) (Das et al., 2017).Free flowing retting process water is circulated continuously maintaining the optimum conditions mainly pH which allows the retting microbes to show their biochemical activities appropriately.The microbial assessment of retting water is presented in Table 2.

Table - 2 : Microbial assessment of retting water.

Parameters	Retting under conventional stagnant water system	Retting under free flowing water system
Total microbial population (cfu ml^{-1})	40-47 × 10^5	35-42 × 10^5
Pectin degraders (cfu ml^{-1})	28-30 × 10^5	32-37 × 10^5
Xylan degraders (cfu ml^{-1})	20-25 × 10^5	30-35 × 10^5

The physic-chemical analysis of the water samples collected from both the tanks shows a sharp decrease in pH. The pH value recorded in free flowing retting tank was (6.54) as compared to the stagnant water retting tank (6.85). The retting water becomes more acidic at the later stage of retting because of the production of organic acids such as acetic, lactic and butyric α-ketoglutarics(Majumdar

et al., 2013). The electrical conductivity of the post retting water samples of free flowing retting tank was higher (778 µS/cm) than the post retting water sample of stagnant water retting tank (759 µS/cm). This gradual increase in the EC of post retting water samples might be because of the addition of salts like Ca, Mg, Fe etc. by their release from the ash of jute plants during the process of jute retting in bio decomposition of polyuronides, pectins etc. (Ahmed &Akhter, 2001). It was also observed an increase in the total nitrogen content in the post retting water sample of free flowing water retting tank 16.8% than the conventional retting tank. During the whole retting process degradation of the microbes in green jute plants takes places which in turn increase the nitrate-N, ammoniacal-N and the total nitrogen at the later stage of retting (Akhter, 2014; Raveh&Avnimelech, 1979). Not only total nitrogen but also the total phosphorus content wasrecorded high in the post retting water sample of free flowing retting tank. When the jute plant degrades during retting it also release phosphorus in the biochemical site of retting because it absorbs P both from the applied Phosphorusfertilizer and soil (Haque et al., 2002).The physio-chemical parameters of retting water samples were presented in Table 3.

Table - 3 : Physio-chemical parameters of retting water samples.

Retting Condition	pH		EC (µS/cm)		Nutrient %					
					N		P		K	
	pre retting	post retting	pre retting	post retting	pre retting	post retting	pre retting	post retting	pre retting	post retting
Stagnant water retting	7.57	6.85	331	759	5.2	11.2	2.27	3.89	29.22	68
Free-flowing water retting	7.06	6.54	342	778	5.8	16.8	2.6	4.98	35.07	79.04

CONCLUSION

The free flowing water retting technology is only a minor modification over the conventional stagnant water retting process which is used by most of the farmers in all over India. This technology not only increases the fibre yield and its quality, it is also environmental friendly. The pollution created in the conventional stagnant water retting can be easily avoided by using this technology. Also after retting the water can be safely be used in integrated farming, fish cultivation etc. as the water during retting process is been filtered and circulated continuously hence does not allow any deposition of degraded retting materials.

ACKNOWLEDGEMENT

The authors are grateful for financial support National Food Security Mission (NFSM)-CC-Jute, DAC & FW, Ministry of Agriculture & Farmers Welfare, Govt. of India, New Delhi.

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Journal of Natural Resource and Development 16 (2) 20-23, 2021 | NAAS RATING : 3.77 | ISSN-0974-5033

EFFECT OF INTEGRATED NUTRIENT MANAGEMENT ON WHEAT VARIETIES UNDER LATE SOWN CONDITIONS

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Received : 25.06.2021 Accepted : 22.07.2021

ABSTRACT

Field experiment was conducted during rabi season of year 2017-18 to find out the suitable variety of wheat and appropriate nitrogen level for late sown conditions. The variety PBW-343 recorded significant increase in growth parameters, yield components and grain yield and nitrogen uptake in comparison to other varieties viz., K-9423, UP-2425 and HD-2643. Application of 120 kg N c + 25% N (30 kg N) significantly improved dry matter accumulation, number of spikes, number of grains ear^{-1}, test weight and grain yield and uptake of nitrogen over all the lower doses of nitrogen.

Keywords : Wheat, nitrogen, dry matter, integrated nutrient management.

INTRODUCION

Wheat is the most staple crop of our country. India is firmly occupying the second position among the wheat producing country in the world. In India, Uttar Pradesh is leading wheat growing state with an area of 9.65 m ha (36.6%), production of 26.87 m tones (39.30%) and productivity of 2785 kg ha^{-1}. Weather is one of the key factor influencing production and productivity of wheat crop. In eastern Uttar Pradesh late sown wheat covers more than half of its acreage in rice – wheat cropping system. The common sowing time of late wheat in this region is from late November to end of December. The wheat varieties having short duration appear to be most suitable under late sown conditions due to the characteristics of their shorter growing period available to the crop. Delayed sowing enforces maturity under the influence of high temperature and by and large, farmers attempt to make a mend it by excessive application of nutrient particularly nitrogen ignoring the crop yield physiology in constraints environment. Under this situation integrated nutrient management is a better approach for supplying nutrition to the crop by including organic and inorganic resources of nutrients. Application of farm yard manure along with recommended doses of fertilizers of NPK helps in improving declining productivity to a great extent

and getting suitable production to a considerable level. To find out suitable variety and integrated nutrient management practices for such conditions is of a great significance.

MATERIALS AND METHODS

The field experiment was conducted at the farm of Department of Agronomy, Kulbhaskar Ashram Post Graduate College, Prayagraj, Uttar Pradesh during the rabi season of year 2017-18 with a view to find out the most suitable variety and its integrated nutrient management practices for late sown conditions. The soil was sandy loam with a pH 8.2. The organic carbon was 0.35%, available nitrogen, phosphorus and potassium content of the soil were 240.43 kg, 18.38 kg and 280.33 kg ha^{-1}, respectively. The treatment comprised of four varieties PBW-343, K-9423, UP-2425 and HD-2643 and five nutrient levels (80 kg N ha^{-1}, 120 kg N ha^{-1}, 80 kg N ha^{-1} + 25% N (20 kg N) through FYM, 120 kg N ha^{-1} + 25% N (30 kg N) through FYM and 160 kg N ha^{-1} were laid out in Randomized Block Design with three replications. Wheat varieties were sown on 20 December and harvested in third week of April. Half dose of nitrogen combined with FYM as per treatments and a common dose of phosphorus @ 60 kg ha^{-1} and potash 40 kg ha^{-1} were applied as basal doses. Well rotten FYM having 0.35% N, 0.20 % P_2O_5 and 0.30% K_2O was broadcasted as per treatment and mixed well into the soil with the help of spade. The remaining amount of nitrogen was top dressed just after first irrigation i. e. 30 days after sowing.

RESULTS AND DISCUSSION

It is evident from table-1 that the varieties differed for growth, yield attributes and yields of the crop. Growth parameters viz. shoot m^{-1}, row length and dry matter production g m^{-1} row length at harvest stage were found significantly higher in variety PBW-343 compared to others. The leaf area index at 60 days after sowing of both the varieties PBW-343 and UP-2425 were found non- significant but superior over other two varieties. The variety PBW-343 also gave significantly more number of spikes m^{-1} row length, grain ear^{-1}, 1000-grain weight resulting in higher grain yield over K-9423 and HD-2643, however, it was at par with UP-2425. Significantly minimum growth and yield contributing characters and yield were recorded with HD-2643 which was almost similar with K-9423.The nitrogen uptake by grain and straw was significantly influenced due to the varieties. The highest nitrogen uptake values were recorded observed with variety PBW-343 due to higher grain and average straw yield. The lowest nitrogen uptake was noted with variety HD-2643 because of poor nitrogen absorption capacity along with low grain and average straw yields.

The table -1 also revealed that application of N levels significantly affected growth, yield attributes and yields of the crop. Growth attributes like shoot m^{-1}, row length and dry matter accumulation at harvest stage significantly increased with dose of 120 kg N ha^{-1} + 25% N through FYM as compared to all the rest treatments but was at par with 120 kg N ha^{-1}, while maximum LAI was observed with treatment 120 kg N ha^{-1} + 25% N through FYM and it was statistically superior over all the treatment combinations (Singh *et. al* , 2013 and Kumar *et. al.*, 2017). The use of organic manures helped in improvement of physical and biological properties of soil and better supply of N P K along with micronutrients resulting higher fertilizer use efficiency positively affected growth attributes. These results are accordance with Singh *et. al.*(2011). The significant increased in yield attributes viz., spike m^{-1} row length, grain ear^{-1} and 1000-grain weight were recorded with application of 120 kg N ha^{-1} + 25% N through FYM. This

Table - 1 : Effect of varieties and integrated nutrient management on growth and yield attributes of late sown wheat

Treatments	Shoots m^{-1} row length	LAI at 65DAS	Dry matter accumulation (g m^{-1} row length)	Spikes m^{-1} row length	No. of grains ear^{-1}	1000-grain weight	Grain yield q ha^{-1}	Straw yield q ha^{-1}	Nitrogen uptake kg ha^{-1}	
									Grain	Straw
Varieties										
PBW -343	76.78	3.43	258.53	72.51	37.17	41.43	39.69	50.18	78.8	33.7
K-9423	69.70	3.35	242.60	68.37	33.48	36.78	33.10	55.56	58.3	34.0
UP-2425	71.60	3.42	248.76	71.15	36.39	40.76	38.78	51.59	76.3	33.2
PBW	70.38	3.17	235.90	70.13	33.57	31.27	33.53	58.99	56.5	36.7
CD = (P=0.05)	1.93	0.12	9.35	2.34	1.16	1.66	2.60	2.86	2.57	2.01
Nutrient levels										
80 kg N ha^{-1}	68.82	2.78	237.60	67.23	34.02	37.03	33.77	52.73	53.8	23.0
120 kg N ha^{-1}	73.35	3.61	250.56	72.23	35.34	39.49	36.07	54.25	75.2	38.9
80 kg N ha^{-1}+20 kg N ha^{-1}(25% through FYM)	69.93	2.86	243.33	70.59	34.52	38.15	35.12	53.67	61.3	30.6
120 kg N ha^{-1}+30 kg N ha^{-1}(25% through FYM)	74.22	4.12	260.10	74.93	37.42	41.87	40.64	56.10	83.4	40.8
160 kg N ha^{-1}	69.20	4.01	240.83	67.65	34.35	37.76	34.48	53.40	71.4	38.9
CD = (P=0.05)	2.41	0.14	10.47	2.93	1.31	1.87	2.91	3.19	2.87	2.24

combination increased the availability of N P K and micronutrients to plants and their translocation towards reproductive parts which increased spike length resulting in more number of grains ear^{-1} and relatively higher test weight. The grain and straw yields were calculated maximum with integrated nitrogen application through fertilizer and farm yard manure but were found superior only over 80 kg N ha^{-1}. It might be due to increase in yield attributing characters. The results in conformity with those of Singh *et. al.* (2013) and Kavinder *et. al.*(2019). Significantly maximum nitrogen uptake was observed with 120 kg N ha^{-1} + 25% N through FYM while the lowest uptake was recorded with 80 kg N ha^{-1}. These results are in agreement with the findings of Shah *et. al.* (2006), Singh et. (2013) and Kumar *et. al.* (2017).

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Journal of Natural Resource and Development 16 (2) 24-28, 2021 | NAAS RATING : 3.77 | ISSN-0974-5033

GENETIC VARIABILITY STUDIES IN OKRA ADVANCED BREEDING LINES FOR YIELD AND YIELD ATTRIBUTING TRAITS. [ABELMOSCHUS ESCULENTUS (L.) MOENCH]

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Received : 15.04.2021 Accepted : 22.05.2021

ABSTRACT

The genetic variability analysis for yield and yield attributing traits in30 advanced breeding lines of okra revealed high genetic variability and high degree of transmission of major yield attributing traits. Analysis of variance indicated that there were significant differences among all lines for the yield and yield attributing traits except for node number of first flowering.High GCV (>20%) values, high heritability (30%)coupled with higher value of expected genetic gain over mean (>20%) indicated involvement of additive gene action in the traits like number of fruits per plant, fruit length, leaf blade length and width, petiole length, plant height and stem diameter. Further thesetraits could be used as criteria of indirect selection for yield improvement in okra breeding programs.

Key words: *GAM, genetic variability, heritability, indirect selection, advanced breeding*

INTRODUCTION

Okra [*Abelmoschus esculentus* (L.) Moench] is a warm-season annual herbaceous vegetable crop which can be found in nearly every market in India.The crop, which is generally self-pollinated, (Martin, 1983), belongs to the Malvaceae (mallow) family and has its origin in West Africa(Joshi *et al.,* 1974). Okra is popular in the Asia, southern United States, parts of Africa, Middle East, the Caribbean and South America.It is an essential crop in many countries due to its high nutritional value. Also, people can use many parts of the plant, including the fresh leaves, buds, flowers, pods, stems, and seeds.Tender immature fruits are used in a variety of ways as cooked vegetable, boiled, or fried, soups, sauces and stews in meat, frozen, canned and dehydrated products. It is also used in thickening of soups and gravies because of its high mucilage content.Its ripe seeds can be dried, roasted and ground to be used as a coffee substitute(Gemede*et al.,* 2015). The oil from its seeds is utilized in perfume industry.The seed of okra are reported to contain between 15 and 26 % protein and over 14% edible oil content. The dried

fruit shell and stem containing crude fibre are used in paper industry.For a year-round consumption sun dried, frozen, and sterilized fruits are also important market products. Nutritionally, okra fruits are rich in vitamins (C, A and B) and minerals (Ca, P, Mg and Fe). It also contains iodine and is, therefore, recommended for the treatment of goitre. Mucilage and fibre content present in okra helps in lowering down the glucose level of blood, hence, good for diabetic patients.

Globally, okra is grown in an area of 11,17,806 hectares with a production of 87,06,312 tonnes and 7.8 tonnes/ha productivity (Anon. 2017). The crop is the fifth most popular vegetable in India.Its production is widespread across all the major regions.India ranks first in the world with annual production of 60,03,000 tonnes produced from 5,07,000 hectares area with a productivity of 11.8 tonnes/ha (Anon. 2017).

In India, okra is found in its fresh state in almost all markets during summer rainy season and in a dehydrated form during the dry season, particularly in Northern North due to its strong commercial value.It is therefore important that plant breeders developed improved varieties of the okra vegetable, which seems to be the last concern in their research programmes for adoption by Indian vegetable farmers and for the export market.Varieties that combine higher yields and early maturity with prolong harvesting habit and more resistant to diseases and pests,would be ideal to the okra vegetable industry in India. Improved varieties in terms of immature fruit color, fruit pubescence and ridges per fruit are very much desired in the Indian market.In addition, a wide variability in germplasm of okra (Oppong-Sekyer*et al.,* 2011) also provides an ample scope for its improvement for horticultural traits. Characterization of crops is a very essential first step in any crop improvement program. Characterization of genetic resources, therefore, refers to the process by which accessions are identified and distinguished according to their characters.Moreover, information obtained on genetic relatedness among genetic resources of crop plants is useful, both for breeding and germplasm conservation (Brown *et al.,* 1990) and thus exploit such variation inbreeding programmes to develop improved, high yielding varieties. Accordingly, the crop breeding programmes have been designed to suffice the requirements of consumers. This investigation was undertaken to study okra genotypes based on morphological traits to select the most promising germplasm for cultivation and use in improvement programs.

MATERIALS AND METHODS

The present experimental material comprised of 30advanced breedinglines developedat Ravi Hybrids Seeds Pvt. Ltd. Hyderabad,Telangana state India. The lines were characterized and evaluated for genetic variabilityduring summer 2020at R & D station Sujatha nagar Telangana state India.The genotypes were sown with a spacing of 30cm plant to plant and 90 cm row to row in three completely random replicated blocks under irrigated condition and all standard agronomic practices were followed.The observationswere recorded for plant height (cm), stem diameter (cm),node number of first flower appearance, leaf length (cm),leaf width (cm), petiole length(cm), fruit length (cm) fruit diameter (cm) and yield per plant (g) on 5 randomly chosen plants in each replication at stages of crop growth when the character under study was fully expressed.

Table : 1 - List of advanced breeding lines

Genotype	Source	Season
RHS-S20-1	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-2	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-3	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-4	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-5	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-6	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-7	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-8	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-9	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-10	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-11	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-12	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-13	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-14	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-15	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-16	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-17	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-18	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-19	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-20	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-21	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-22	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-23	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-24	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-25	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-26	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-27	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-28	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-29	RHS- R&D Sujatha nagar TS	Summer-2020
RHS-S20-30	RHS- R&D Sujatha nagar TS	Summer-2020

The genotypic and phenotypic components of variance were estimated as per the formulae suggested by Lush (1940). Estimates of genotypic and phenotypic co-efficients of variations were calculated as per the standard formulae Borton (1952). The broad sense heritability was calculated for all the characters as the ratio of genotypic variance to total or phenotypic variance (Lush 1940). The expected genetic gain over for each character is calculated by the method suggested by Johnson et al., 1952.

RESULTS AND DISCUSSION

The analysis of variance (Table 2) showed differences for all the characters except for node number of first flowering which indicates presence of variation for all characters among the population. Maximum variability was recorded for yield per plant followed by plant height, petiole length, number of fruits per plant and leaf blade length.

The extent of variability measured in terms of range, mean, genotypic coefficient of variation (GCV), phenotypic coefficient of variation (PCV), heritability in broad sense, genetic advance and genetic advance as per cent of mean were presented in Table 3. A considerable variation was observed for most of the characters. The PCV estimates were higher than the GCV estimates for all the traits but the difference was very narrow except flower length and node number at 1st flower appearedindicating the least effect of environment in the expression of these traits. GCV estimates were maximum in yield per plant followed by number of fruits per plant,leaf blade width, petiole length, plant height and fruit length which are important yield attributing characters. These results are in agreement with that of Mehta *et al.,* (2006) and Badiger.et al., (2017).

Heritability estimates were high for plant height (98.74%), leaf blade width (95.72%), fruit length (95.52%), petiole length (90.93%), number of fruits per plant (80.48%), stem diameter (78.65%), yield per plant (73.37%), leaf blade length (71.60%), fruit diameter (56.11%) and flower diameter (40.91%).Moderate heritability was observed for the traits flower length (24.81%) and node number of first flowering (18.64%) (Table 3).

High heritability accompanied by high genetic advance is more useful than heritability alone and considerable importance could be made in these characters by predicting the result and

selecting the best individual (Johnson *et al*, 1955). High heritability values were associated with high genetic advance as per cent of mean for number of fruits per plant, fruit length, and leaf blade length and width, petiole length, plant height and stem diameter. This may be attributed due to considerable additive gene effects on these traits. These findings are in consonance with the findings of earlier workers (Singh *et al.,* 2006; Mohapatra *et al.,* 2007; Reddy *et al.,* 2012) inokra.

Table : 2 - Analysis of variance for yield and yield attributing characters of Okra.

Source of Variance	d.f	NFF	LBL	LBW	PL	FL (cm)	FLD (cm)	FL (cm)	FD (cm)	SD (cm)	P. Ht (cm)	NFPP	YPP (g)
Treatment	29	0.79	36.34**	21.07**	79.81**	0.61*	0.59**	19.62**	0.28**	0.37**	1357.94**	40.96**	9065.79**
Replication	2	0.63	4.70	4.17	5.31	0.95	0.06	1.02	0.18	0.02	60.36	9.11	1556.65
Error	58	0.44	4.24	0.31	2.57	0.30	0.19	0.30	0.06	0.03	5.73	3.06	378.65
Total	89												
SEM		0.40	1.19	0.32	0.92	0.30	0.25	0.32	0.14	0.10	1.38	1.01	18.06
SED		0.54	1.68	0.45	1.31	0.45	0.36	0.45	0.20	0.14	1.95	1.43	25.54
Cv@5%		15.00	11.34	6.35	8.27	10.37	9.79	4.50	11.26	8.28	2.64	15.26	16.45
Cd@5%		1.09	3.37	0.91	2.62	0.90	0.72	0.90	0.39	0.29	3.91	2.86	51.13

*, ** Significant at 5 and 1 percent levels respectively values in parenthesis indicate degrees of freedom.

Table : 3 - Genetic parameters for yield and yield attributing characters of Okra.

Characters	RANGE		Mean	PCV	GCV	$H_{(BS)}$ (%)	GA	GAM (%)
	Min	Max						
No of Nodes at First Flowering	3.50	5.60	4.55 ± 0.40	17.13	7.40	18.64	0.29	6.58
Leafe Blade Length	10.03	22.03	16.03 ± 1.19	21.27	18.00	71.60	5.70	31.38
Leafe Blade Width	2.70	13.07	7.88 ± 0.32	30.72	30.05	95.72	5.30	60.57
Petiole Length	11.40	29.10	20.25 ± 0.92	27.48	26.20	90.93	9.97	51.48
Flower Length (cm)	4.07	6.03	5.05 ± 0.30	11.96	5.96	24.81	0.33	6.11
Flower Diameter (cm)	3.40	5.50	4.45 ± 0.25	12.74	8.15	40.91	0.48	10.74
Fruit Length (cm)	7.00	17.53	12.27 ± 0.32	21.27	20.78	95.52	5.11	41.85
Fruit Diameter (cm)	1.53	2.80	2.17 ± 0.14	17.00	12.74	56.11	0.42	19.66
Stem Diameter (cm)	1.43	2.57	2.00 ± 0.10	17.92	15.89	78.65	0.61	29.04
Plant Hight (cm)	59.27	148.10	103.68 ± 1.38	23.56	23.41	98.74	43.46	47.92
No. Fruit Per Plant	6.43	18.33	11.47 ± 1.01	34.54	30.99	80.48	6.57	57.27
Yield per plant	102.50	288.00	190.22±18.66	31.87	27.29	73.37	91.61	48.16

CONCLUSION

On the whole, from the genetic variability analysis it is evident that the advanced breeding lines utilized in the present investigation possessed considerable genetic variation. All the genotypes showed considerable variability in the observed yield and yield attributing traits as it is evident from the estimates of coefficients of variation, heritability, genetic advance and genetic advance as per cent of mean. The spectrum of large variability for economically important characters will provide the breeder a good scope for the genetic improvement in okra. High heritability and genetic advance were observed for majority of the characters, which suggested that they are controlled by few genes.Thus, advanced breeding lines with high yield and attractive fruit color can be used as parents in the hybridization programs and can be

advanced to replication yield trials for their evaluation.

ACKNOWLEDGEMENT

Declaration: No conflict of interest.

Authors' contribution

Conceptualization of research (RM); Designing of experiments (RM); Execution of field/lab experiments and data collection (RM); Analysis of data and interpretation (RM&MH); Preparation of the manuscript (MH).

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Journal of Natural Resource and Development 16 (2) 29-34, 2021 | NAAS RATING : 3.77 | ISSN-0974-5033

ROLE PERFORMANCE OF FARM WOMEN IN DAIRY FARMING PRACTICES OF AMBEDKAR NAGAR DISTRICT OF U.P.

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Received : 21.04.2021 Accepted : 19.05.2021

ABSTRACT

In livestock, especially dairy is a supplementary enterprise to crop farming. The present study was conducted in Ambedkar Nagar district of Uttar Pradesh with the objectives to study the role and participation of rural women in dairy farming. Nearly two third of farm family in district are associated with livestock farming. An exploratory study was conducted in Ambedkar Nagar district of Uttar Pradesh to ascertain the role and participation of rural women in dairy farming activities, using a pretested interview schedule by personal interview for sample size of 120 rural women in Katehari, Tanda and Jalalpur tehsils of Ambedkar Nagar district of Uttar Pradesh (India). The socio personal studies revealed that majority of the women were middle aged (54.2%) and in joint families (65%) with 51.76 per cent being literates. Most of the respondent families were marginal farmers (35 %) with low annual family income (59.17 %) having agriculture (52.5 %) as the major occupation. About 30 operations of dairy farming were selected in consultation with experts and were broadly categorized into six aspects as feeding, management, breeding, health care, processing & marketing and miscellaneous. The study revealed that women participation was maximum in caring of pregnant animals and Care of sick animals (100%) followed by arranging materials during parturition (46.67 %) and taking animals for pregnancy diagnosis (35.83 %).The study revealed that 95.83 per cent women involved in milking while 100 per cent women cared for new born or young animals. The farm women actively involved in cleaning of animal sheds (95 %), feeding the animals (100%) and disposal of cow dung (90%).The farm women participation was least in farm record maintenance (26.67%) fallowed by getting loans or credits from the banks (21.66 %).The study concluded that women participated mostly in nonfinancial activities. The trainings programmes related to fodder management and scientific managemental practices of dairy animals and milk processing should be organized to motivate the rural farm women to acquire newer and easier scientific technologies and to

enhance the animal productivity to enhance income and status of women. Far rural farm women focused approach were advocated as a part of the strategy under which sufficient number of women dairy cooperatives societies were formed at village level with the point of view that would provide a source of additional income and an organized platform to seek socio- personal, physical and economical well being.

Key Words: *Socio-personal profile, Dairy Farming, Role Rural Women.*

INTRODUCTION

Involvement of Indian women in national progress at all levels is undisputable reality although the degree of involvement varies from time to time and region to region. Prosperity and growth of a nation depends on the status and development of its women as they not only constitute nearly half of the population, but also positively influence the growth of remaining half of the population. The Indian rural women crucial role of women in agriculture, allied occupations and household activities. Ambedkar Nagar district encompasses geographical area 2350 sq.km. and has a population of 2397888 (person) including 1212410 (males) and 1185478 (females). The district has a sex ratio of 978 female for every 1000 males. The literacy percentage in the district 72.23% person in which 80.66% male and 62.66 female. In district vast of majority of its population (80%) were engaged in agriculture and allied activities for their livelihood. About 85% farmers came under small and marginal category. Under the existing agrarian structure, most of the rural farm families are of small and marginal in nature, which are living below the poverty line with the continued threats to their livelihood security characterized by low in food and income securities, unemployment, health problems, education etc. Women constitute 71 per cent of the labour force in livestock sector as against 35 per cent in crop farming (Sigh *et al.,* 2015). The underestimated and undervalued. Women play significant and crucial role in agricultural development and allied fields. The present investigation was designed to study the role and extent of involvement of rural women in dairy farming activities.

MATERIALS AND METHODS

The present investigation was designed to study the role and participation of rural women in dairy farming. Purposive sampling technique was used for selecting Katehari, Tanda and Jalalpur tehsils of Ambedkar Nagar district of Uttar Pradesh on the basis of increased rate of prospective dairying through Ambedkar Nagar District Parag Milk and Marketing Co-operative. A pretested semi – structured interview schedule was used to collect the data by personal interview method. Multistage random sampling was applied for selecting sixteen respondents from each purposely selected five villages with the help of veterinary officers, key informants and village level functionaries, thus making a total of 120 rural women for the final study. The collected data were coded, tabulated, classified and further categorized for systematic analysis. The descriptive statistical tools like average and percentage were used for analysis of data. The results were interpreted accordingly.

RESULTS AND DISCUSSION

The distribution of respondents according to their personal, social and economic traits included in the study is presented in Table 1.

Table - 1 : Distribution of respondents according to their personal, social and economic traits.

N=120

S. N.	Characters	No.	%
1.	**Age group**		
	16-30 years (Young)	14	11.67
	31-45 years (Middle)	65	54.2
	46-65 years (Old)	41	34.17
2.	**Education status**		
	Literates	62	51.76
	Illiterates	58	48.33
3.	**Family structure**		
	Joint	78	65.00
	Nuclear	42	35.00
4.	**Livelihood**		
	Agriculture	63	52.50
	Labour	38	31.67
	Home makers	16	13.33
	Government job	03	02.50
5.	**Marital status**		
	Married	102	85.00
	Unmarried	10	08.33
	Widow	6	05.00
	Divorce	02	01.67
6.	**Land**		
	Landless	23	19.16
	Marginal	42	35.00
	Small	39	24.16
	Large	16	13.33
7.	**Income**		
	Low	71	59.17
	Medium	40	35.83
	High	09	05.00
8.	**Dairy herd size**		
	Small (2-6 no.)	16	12.50
	Medium (5-12 no.)	97	80.83
	Large (12-25 no.)	7	5.83
9.	**Social participation**		
	Low	72	60.00
	Medium	31	25.83
	High	17	14.17

The findings of the study revealed that 54.2 per cent of rural women were middle aged in the study region followed by old age (34.17%) and young (11.67 %) category. The probable reason for such distribution might be that, majority of the middle aged rural women perceived dairy farming as a profitable avenue and took up as a subsidiary occupation. The study revealed that 51.76 per cent of respondents were literates while 48.33 per cent of the women were illiterates. Regarding the type of family, majority of farm women lived in joint family (65%) while 35 per cent lived in nuclear family. About the occupation, the study found that agriculture (52.50%) was the major occupation of the family followed by laborers (31.67%). The remaining farm women included home makers (13.33%) and government job holders (2.5%).The study reported that 85 per cent of respondents were married while 8.33 per cent rural women were unmarried and 5% widow fallowed by 1.67% divorce. The present study exhibited that 59.17 per cent of the families had low income followed by medium income category (35.83 %) and high income group (05.0 %). The study revealed that 35.0 per cent farm women families had marginal land followed by small farmers (24.16 %). It was also observed that 19.16 per cent farm women were landless and 13.33 per cent were large farmers. With regard to dairy herd size, 80.83 per cent families were in medium category while 24.16 per cent families had smaller livestock holding. The study reported that 60.00 per cent rural women had low level social participation while 25.83 had medium level social participation as supported by Jain, V. and Verma, S.K (1992).

Role and participation of rural women in dairy farming:

The study focused mainly on six major operations of dairy farming. The findings of study are depicted in Table-2.

Table-2. Distribution of the rural women on the basis of their evolvement in dairy farming activities.

N=120

S. N.	Characters	No.	%
1.	**Animals Feeding& Watering**		
	Taking animals for grazing	76	65.00
	Fodder collection	98	81.66
	Chaffing the fodder	112	93.33
	Mixing green fodder with roughage	120	100.0
	Feeding the animals	120	100.0s
	Storage of feed & fodder	117	97.50
	Watering the animals	120	100.0
2.	**Managemental practices**		
	Construction of animal sheds	68	56.67
	Cleaning of animal sheds	114	95.00
	Washing & grooming of animals	79	65.83
	Milking	115	95.83
	Disposal of cow dung	108	90.00
	Maintaining farm & dairy records	42	35.00
3.	**Breeding management**		
	Taking animals for Artificial Insemination	41	34.17
	Taking animals for natural service	12	10.00
	Taking animals for pregnancy diagnosis	43	35.83
	Arranging materials during parturition	56	46.67
	Calling veterinarian during dystocia	32	26.67
4.	**Health Care management**		
	Care of sick animals	120	100.0
	Care of pregnant animals	120	100.0
	Taking animals for treatment	114	95.00
	Vaccination/Medication	117	97.50
5.	**Milk Processing & Marketing**		
	Processing of livestock products	118	98.33
	Sale of milk and milk products	58	48.33
	Sale & purchase of animals	68	56.66
	Purchase of feeds and fodder	52	43.33
6.	**Other miscellaneous activities**		
	Getting loans/credit from banks/cooperatives	26	21.66
	Record maintenance	32	26.67

N=Number of observations

Feeding and watering : Table 2 indicates that most of the work regarding feeding and watering of animals was the sole responsibility of the women group. They were responsible for the tasks like taking the animals for grazing, fodder collection, chaffing and storage of fodder etc. All the activities regarding feeding and watering were done only by women, which is in consonance with the findings of Gupta *et al.* (1986) and Rangnekar *et al.* (1992). It was observed that women in the old age category were mostly involved in taking the animals out for grazing, as they could not engage themselves in other jobs which involved physical straining. On the other hand, women in the middle age group involved themselves in all the activities equally as per the family situations. With regard to storage of fodder, women involved themselves in hay making and were not aware of the importance of silage making. Table 2 depicts the activities of rural women in dairy farming. The study revealed that 86.66 per cent of rural women were involved in taking animals for grazing (65%) followed by fodder collection (81.66%). The study exhibited that 100 per cent respondents were involved in mixing green fodder with roughage and feeding and watering to animals. Similar findings were reported by Jain and Verma (1992).The study revealed that 93.33 per cent of women involved in activities like chaffing the fodder while 97.50 per cent women performed storage of feed & fodder for animals. The women also looked after mixing green fodder (97.5 %) for feeding of animals which was also reported by Toppo *et al. (2004)*.

Managemental practices: Women actively participated in work of animal shed construction of animal sheds with locally available resources, washing & grooming of animals were also performed by women. It was observed that respondents majorly participated in milking of animals followed by their involvement in cleaning of milking utensils. The study also revealed that 70.83 per cent women performed washing and grooming of animals. Though majority of the women were illiterate, 35 per cent of farm women maintained a small book or piece of paper as a record. Similar findings were reported by Yadav *et al.* (2005). The study revealed that women performed activities like Milking (95.83 %), cleaning of animal sheds (95%) and disposal of cow

dung or preparation of cow dung cakes (90 %). Similar findings were observed by Jain and Verma (1992).

Breeding management: It was found that rural women participation in breeding activities to be least among all the selected activities due to social mores and taboos in society. The study revealed that 35.8 per cent of farm women were actively involved in taking animals for pregnancy diagnosis. The study also indicates that 26.6 per cent respondents called the veterinarians during dystocia while 46.6 per cent respondents arranged bedding materials during parturition. These findings are in conformity with findings of Tripathi and Bhanja (2000).The study also reported that 34.17 per cent of farm women took animals for Artificial Insemination while 10 per cent of rural women took the animal for natural service. Similar findings were also reported by Singh (2003).

Health care management: Most of the respondents interviewed were of the view that they required lot of training and knowledge with regard to the health care aspects The women in their late middle and old age actively participated in health care as they had learnt the things by seeing and out of experience.. These results are in confirmation with the results of Bhurtel (1996). The health care of animals was solely performed by women folk in the study area. The study revealed that 100 per cent rural women were engaged in health care of pregnant animals and Care of sick animals while 95 per cent respondents looked after taking animals for treatment. The study revealed that care of sick animals (86.66%) was exclusively performed by farm women. The findings are in conformity with the findings of Rangnekar *et al.* (1992).The study reported that women were involved in taking animals for health treatment like vaccination and medication (97.50%) Similar findings were reported by Tripathi and Bhanja (2000).

Milk Processing & Marketing: The women folk mostly participated in preparation of milk products like Curd, paneer, ghee, butter and khoa only for their household consumption. etc. Only few women took up processing on small scale for sale specially Curd, ghee and khoa. Mostly milk was supplied to Parag milk collection centers and sweet makers of district. The study revealed that 98.33 per cent respondents involved in sale of milk and milk products while 48.3 per cent of farm women performed milk processing activities like Curd, ghee, khoa making and butter preparation for sale . Similar findings were reported by Toppo *et. al.* (2004).The study also revealed that women participation was less as compared to men in the areas of sale and purchase of animals (56.6 %) and purchase of feed and fodder (43.33 %).These findings are in consonance with the reports of researchers Tripathi and Arya(1995).

Other miscellaneous activities: The rural women perceived the activities of getting loans/credits from the banks were the responsibility of men and hence only 21.66 per cent of women were involved in this activity. Similar findings were recorded by researcher Devaki (1999). Majority of the farm women in study area were ignorant about record maintenance and hence, it was observed that only 26.67 per cent of respondents maintained records in the form of small book or piece of paper. Similar findings were observed by Singh (2003) with regards to record maintenance.

CONCLUSION

Farm women handle most of the critical jobs and are considered to be the main actors in small scale farming. Though women play a significant role in dairy farming their control over livestock and its products. Major constraints recorded were lack of awareness about advantage and facilities provided

by the Government and milk unions for rearing animals, lack of knowledge about the women rights for their empowerment. The study also implies that trainings programmes related to fodder management and scientific manage mental practices should be organized to motivate the rural farm women to acquire newer and easier scientific technologies and to enhance the animal productivity and need to women focused approach should be advocated as a part of the strategy under which sufficient number of women dairy cooperatives societies were formed at village level with the point of view that would provide a source of additional income and an organized platform to seek personal, social and other grievances which ultimately affects their physical and economical well being.

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Journal of Natural Resource and Development 16 (2) 35-43, 2021 | NAAS RATING : 3.77 | ISSN-0974-5033

BIRDS OF BASTAR, CHHATTISGARH

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Received : 02.06.2021 Accepted : 05.07.2021

ABSTRACT

Bastar is a well-known district in the state of Chhattisgarh. This district is blessed with ample biodiversity. The floral diversity of this district is vast which in turn supports the diversified fauna of the state. A major portion of the population living here are tribal which play a very crucial role in the conservation of this gift of biodiversity. The current study records the avian diversity of the Bastar district. In the current study, 355 species of birds were recorded belonging to various families and orders.

Keywords : *Birds, bastar, biodiversity.*

INTRODUCTION

Bastar is a district within the state of Chhattisgarh in India. Jagdalpur is its district headquarters. The district has Dantewada in the south, Sukma in the southwest, Narayanpur district in the northwest, Kondagaon district in the north, Nabarangpur in the east, and Koraput (Odisha) as its neighbouring districts. The district possesses a novel mix of ethnic as well as Odia culture. When India achieved independence in 1947, the princely states of Bastar and Kanker acceded to the govt of India and were incorporated to create the Bastar district of Madhya Pradesh. The district, which had a vicinity of 39,114 km², was one of all the most important in India. Again, in the year 1999, two more districts, Dantewada, and Kanker came into existence after separating from Bastar. In 2000, Bastar was one in all the sixteen Madhya Pradesh districts that fashioned a region of the new state of Chhattisgarh. Bastar is understood for its ancient Dussehra competition. The Chitrakoot and Teerathgarh waterfalls are set on the route of Jagdalpur. The district is a part of the Red passageway. Halbi and Gondi are the 2 main languages, whereas Chhattisgarhi and Hindi are also spoken. It has been a tourist attraction for many years for its wealthy diversity of flora and fauna. A vicinity wherever handicraft is most generally practiced in Bastar is Kondagaon. Vessels, jewelry, pictures of the native deities, and a few ornamental works of art are created through a method referred to as the lost wax technique, which is sort of straightforward and happens to be excellent for social group settings.

There were many comprehensive studies performed by many ornithologists in the past in terms of uncovering the avian diversity of central India. Previously, when undivided the avian fauna of Madhya Pradesh included the bird diversity of Chhattisgarh state as well. In this regard, D'Abreu

described 430 avian species from the central province of India. In his work, he also included several species that are found in the adjacent states of Madhya Pradesh. Hewetson (1939) gave an account of the avian faunal diversity from the Betul district of MP. Again in 1956, he published "BirdLife of Madhya Pradesh" in which he described 308 species. Majumdar (1984) presented the avian fauna of Bastar district. Saha (1995), drew an account of 95 avian species from Indravati Wildlife Sanctuary, (Bijapur, CG). An intensive account of bird diversity in Madhya Pradesh and Chhattisgarh was presented by Chandra and Singh (2004), reporting 517 species belonging to 69 families. Jayapal et al., in 2005 did a thorough survey and cataloged avian diversity in Central Highlands of Madhya Pradesh. 449 avian species from Madhya Pradesh (including Chhattisgarh) were described by Ghosh et al., (2008). Apart from these, many valuable contributions were given by many notable researchers from time to time. They all helped in compiling comprehensive data regarding the avian diversity of the central province of the country. Few notable contributions included studies by Barnes (1887), Maries (1897), D'Abreu (1912, 1913, and 1914), Pitman (1913a, b, and c), Hide (1919), D'Cunha and Akhtar (1986), Mohapatra and Rao (1990a and b), Saxena (1998a and b) and Homkar and Shrivastava (2000).

MATERIALS AND METHODS

As stated earlier the Bastar district is gifted with a variety of flora and fauna, so it was expected beforehand that a large number of avian species will be recorded in the area. The data was collected from many localities like Bajawand, Bakavand Reservior, Balenga, Chandrapal, Chitrakota Waterfall, CSBE Colony, Dalpat Sagar, Dandak Cave Road, Dongam, Jagdalpur, Jamawada Reservior, Juganikalar, Kailash Caves, Kanger Valley National Park, Keshkal Ghat, Kohkapal, Koleng Forest Range (Tulsi Dongri) Mundagarh, Kumarawand, Kurandi, Machkot Tiriya Forrest, Matnar, Rajnagar, Suncity, Umargaon. The birds were located on direct sighting, and on the basis of their calls. For sighting, binoculars were used and photographic records were taken with the help of a camera. Later these findings were tallied with the literature for final identification of species.

Table - 1 : Birds Species of Bastar district

S. No.	Name of Species
1	Alexandrine Parakeet
2	Ashy Drongo
3	Ashy Prinia
4	Ashy Woodswallow
5	Ashy-crowned Sparrow-Lark (Ashy-crowned Finch-Lark)
6	Asian Barred Owlet
7	Asian Brown Flycatcher
8	Asian Emerald Dove
9	Asian Koel
10	Asian Openbill
11	Asian Palm-Swift
12	Asian Pied Starling (Pied Myna)
13	Baillon's Crake
14	Banded Bay Cuckoo
15	Bar-headed Goose
16	Barn Owl
17	Barn Swallow
18	Barred Buttonquail
19	Bar-winged Flycatcher-shrike
20	Baya Weaver
21	Bay-backed Shrike
22	Black Baza
23	Black Bittern
24	Black Drongo
25	Black Eagle
26	Black Kite
27	Black Redstart
28	Black Stork
29	Black-crested Bulbul
30	Black-crowned Night-Heron
31	Black-headed Bunting
32	Black-headed Cuckooshrike
33	Black-headed Gull
34	Black-headed Ibis
35	Black-hooded Oriole
36	Black-naped Monarch
37	Black-naped Oriole
38	Black-rumped Flameback (Lesser Goldenbacked Woodpecker)
39	Black-tailed Godwit
40	Black-winged Kite (Black-shouldered Kite)
41	Black-winged Stilt
42	Blue Rock-Thrush

43	*Blue-bearded Bee-eater*
44	Blue-capped Rock-Thrush
45	Blue-faced Malkoha
46	Blue-tailed Bee-eater
47	Bluethroat
48	Blue-throated Flycatcher
49	Blyth's Leaf Warbler
50	Blyth's Pipit
51	Blyth's Reed Warbler
52	Booted Eagle
53	Booted Warbler
54	Brahminy Starling
55	Bronzed Drongo
56	Bronze-winged Jacana
57	Brown Crake
58	Brown Fish-Owl
59	Brown Hawk-Owl
60	Brown Rock Chat (Indian Chat)
61	Brown Shrike
62	Brown Wood-Owl
63	Brown-breasted Flycatcher
64	Brown-capped Pygmy Woodpecker (Indian Pygmy Woodpecker)
65	Brown-cheeked Fulvetta
66	Brown-headed Barbet (Large Green Barbet)
67	Brown-headed Gull
68	Cattle Egret
69	Chestnut-bellied Sandgrouse
70	Chestnut-headed Bee-eater
71	Chestnut-tailed Starling
72	Cinereous Tit (Great Tit)
73	Cinnamon Bittern
74	Citrine Wagtail
75	Clamorous Reed Warbler (Indian Great Reed Warbler)
76	Common Babbler
77	Common Chiffchaff
78	Common Cuckoo
79	Common Greenshank
80	Common Hawk-Cuckoo
81	Common Hill Myna
82	Common House-Martin (Northern House-Martin)
83	Common Iora
84	Common Kingfisher (Small Blue Kingfisher)
85	Common Myna
86	Common Pochard
87	Common Quail
88	Common Redshank
89	Common Rosefinch
90	Common Sandpiper
91	Common Snipe
92	Common Tailorbird
93	Common Woodshrike
94	Coppersmith Barbet
95	Cotton Pygmy-Goose (Cotton Teal)
96	Crested Bunting
97	Crested Goshawk
98	Crested Serpent-Eagle
99	Crested Treeswift
100	Crimson Sunbird
101	Desert Wheatear
102	Dunlin
103	Dusky Crag-Martin
104	Egyptian Vulture
105	Eurasian Collared-Dove
106	Eurasian Coot
107	Eurasian Curlew
108	Eurasian Hoopoe
109	Eurasian Kestrel (Common Kestrel)
110	Eurasian Marsh-Harrier
111	Eurasian Moorhen
112	Eurasian Sparrowhawk
113	Eurasian Wigeon
114	Eurasian Wryneck
115	Fire-capped Tit
116	Forest Wagtail
117	Fork-tailed Drongo-Cuckoo
118	Gadwall
119	Garganey
120	Glossy Ibis
121	Golden-fronted Leafbird (Golden-fronted Chloropsis)
122	Great Cormorant
123	Great Crested Grebe
124	Great Egret
125	Greater Coucal
126	Greater Flameback
127	Greater Painted-Snipe
128	Greater Racket-tailed Drongo
129	*Greater Short-toed Lark*
130	Greater Spotted Eagle
131	Greater Yellownape
132	Green Avadavat
133	Green Bee-eater
134	Green Sandpiper
135	Green-billed Malkoha
136	Greenish Warbler
137	Green-winged Teal (Common Teal)
138	Grey Francolin
139	Grey Heron
140	Grey Junglefowl
141	Grey Wagtail
142	Grey-bellied Cuckoo
143	Grey-breasted Prinia
144	Grey-headed Canary-Flycatcher
145	Grey-headed Lapwing
146	Grey-headed Swamphen (Purple Swamphen)
147	Greylag Goose
148	Grey-throated Martin (Plain Martin)
149	Hair-crested Drongo (Spangled Drongo)
150	Heart-spotted Woodpecker

151	*House Crow*
152	House Sparrow
153	Hume's Warbler
154	Imperial Eagle
155	Indian Blackbird
156	Indian Bushlark (Red-winged Bushlark)
157	Indian Cormorant (Indian Shag)
158	Indian Courser
159	Indian Cuckoo
160	Indian Golden Oriole
161	Indian Grey Hornbill
162	Indian Nightjar
163	Indian Nuthatch
164	Indian Paradise-Flycatcher
165	Indian Peafowl
166	Indian Pitta
167	Indian Pond-Heron
168	Indian Robin
169	Indian Roller
170	Indian Scimitar-Babbler
171	Indian Scops-Owl (Collared Scops-Owl)
172	Indian Silverbill (White-throated Munia)
173	Indian Spot-billed Duck
174	Indian Spotted Creeper
175	Indian Thick-knee (Indian Stone-curlew)
176	Indian Vulture (Indian Long-billed Vulture)
177	Indian White-eye (Oriental White-eye)
178	Indian Yellow Tit
179	Intermediate Egret
180	Isabelline Shrike
181	Jerdon's Baza
182	Jerdon's Leafbird (Jerdon's Chloropsis)
183	Jerdon's Nightjar
184	Jungle Babbler
185	Jungle Bush-Quail
186	Jungle Myna
187	Jungle Nightjar (Indian Jungle Nightjar)
188	Jungle Owlet
189	Jungle Prinia
190	Kentish Plover
191	Knob-billed Duck (Comb Duck)
192	Laggar Falcon
193	Large Cuckooshrike
194	*Large Grey Babbler*
195	Large Woodshrike
196	Large-billed Crow
197	Laughing Dove (Little Brown Dove)
198	Lesser Crested Tern
199	Lesser Sand-Plover
200	Lesser Whistling-Duck
201	Lesser Whitethroat
202	Lesser Yellownape
203	Little Cormorant
204	Little Egret
205	Little Grebe
206	Little Ringed Plover
207	Little Spiderhunter
208	Little Stint
209	Little Swift (Indian House Swift)
210	Little Tern
211	Long-tailed Shrike
212	Malabar Pied-Hornbill
213	Malabar Trogon
214	Malabar Whistling-Thrush
215	Mallard (Domestic type)
216	Marsh Sandpiper
217	Montagu's Harrier
218	Mottled Wood-Owl
219	Northern Pintail
220	Northern Shoveler
221	Olive-backed Pipit
222	Orange-breasted Green-Pigeon
223	Orange-headed Thrush
224	Oriental Darter
225	Oriental Honey-buzzard (Crested Honey Buzzard)
226	Oriental Magpie-Robin
227	Oriental Scops-Owl
228	Oriental Skylark
229	Oriental Turtle-Dove
230	Osprey
231	Pacific Golden-Plover
232	Paddyfield Pipit
233	Paddyfield Warbler
234	Painted Francolin
235	Painted Sandgrouse
236	Painted Spurfowl

237	*Pale-billed Flowerpecker*
238	Pale-capped Pigeon
239	Pallid Harrier
240	Peregrine Falcon
241	Pheasant-tailed Jacana
242	Pied Bushchat
243	Pied Cuckoo (Jacobin Cuckoo)
244	Pied Harrier
245	Pied Kingfisher
246	Pin-striped Tit-Babbler
247	Pin-tailed Snipe
248	Plain Prinia
249	Plaintive Cuckoo
250	Plum-headed Parakeet
251	Puff-throated Babbler
252	Purple Heron
253	Purple Sunbird
254	Purple-rumped Sunbird
255	Rain Quail
256	Red Avadavat
257	Red Collared-Dove (Red Turtle-Dove)
258	Red Junglefowl
259	Red Spurfowl
260	Red-breasted Flycatcher
261	Red-crested Pochard
262	Red-headed Bunting
263	Red-naped Ibis (Indian Black Ibis)
264	Red-rumped Swallow
265	Red-vented Bulbul
266	Red-wattled Lapwing
267	Red-whiskered Bulbul
268	River Lapwing
269	River Tern
270	Rock Eagle-Owl (Indian Eagle-Owl)
271	Rock Pigeon (Blue Rock Pigeon)
272	Rose-ringed Parakeet
273	Rosy Minivet
274	Rosy Starling
275	Ruby-cheeked Sunbird
276	Ruddy Shelduck (Brahminy Duck)
277	Ruddy-breasted Crake
278	Ruff
279	Rufous Treepie
280	*Rufous Woodpecker*
281	Rufous-bellied Eagle
282	Rufous-tailed Lark
283	Savanna Nightjar
284	Scaly-breasted Munia (Spotted Munia)
285	Scarlet Minivet
286	Shikra
287	Short-eared Owl
288	Short-toed Snake-Eagle
289	Siberian Stonechat (Common Stonechat)
290	Sirkeer Malkoha
291	Small Buttonquail (Common Buttonquail)
292	Small Minivet
293	Small Pratincole
294	Speckled Piculet
295	Spot-breasted Fantail (White-spotted Fantail)
296	Spotted Dove
297	Spotted Owlet
298	Spotted Redshank
299	Steppe Eagle
300	Stork-billed Kingfisher
301	Streaked Weaver
302	Streak-throated Swallow
303	Streak-throated Woodpecker
304	Striated Heron (Little Heron)
305	Sulphur-bellied Warbler
306	Sykes's Short-toed Lark (Eastern Short-toed Lark)
307	Sykes's Warbler
308	Taiga Flycatcher (Red-throated Flycatcher)
309	Tawny Eagle
310	Tawny Lark (Sykes's Lark)
311	Tawny Pipit
312	Tawny-bellied Babbler
313	Temminck's Stint
314	Thick-billed Flowerpecker
315	Tickell's Blue Flycatcher
316	Tickell's Leaf Warbler
317	Tickell's Thrush
318	Tree Pipit
319	Tricolored Munia (Black-headed Munia)
320	Tufted Duck
321	Ultramarine Flycatcher
322	Velvet-fronted Nuthatch

323	*Verditer Flycatcher*
324	Vernal Hanging-Parrot (Indian Lorikeet)
325	Watercock
326	Western Crowned Warbler
327	Western Yellow Wagtail
328	Whiskered Tern
329	White Wagtail
330	White-bellied Drongo
331	White-bellied Woodpecker (Great Black Woodpecker)
332	White-breasted Waterhen
333	White-browed Bulbul
334	White-browed Fantail
335	White-browed Wagtail (Large Pied Wagtail)
336	White-eyed Buzzard
337	White-naped Woodpecker
338	White-rumped Munia
339	White-rumped Needletail (White-rumped Spinetail)
340	White-rumped Shama
341	White-rumped Vulture
342	White-throated Fantail
343	White-throated Kingfisher
344	Wire-tailed Swallow
345	Wood Sandpiper
346	Woolly-necked Stork
347	Yellow Bittern
348	Yellow-billed Babbler
349	Yellow-crowned Woodpecker
350	Yellow-eyed Babbler
351	Yellow-footed Green-Pigeon
352	Yellow-legged Buttonquail
353	Yellow-throated Sparrow (Chestnut-shouldered Petronia)
354	Yellow-wattled Lapwing
355	Zitting Cisticola

RESULTS AND DISCUSSION

The current study identified 355 avian species belonging to various families and orders. The checklist is compiled as table 1. It includes 355 species of birds belonging to different families and orders. The identification of birds, common names and scientific names have been followed as per standardised common and scientific names of the birds by is based on Ali & Ripley (1969-74, 1995-96), Grimmett et al. (2000), Manakadan & Pittie (2001) and Praveen et al., (2016).

As it is evident from the data that the study area supports a comprehensive amount of biodiversity within its boundaries. It is very crucial to take safety measures to safeguard these assets for future generations. There are many projects and schemes funded by states as well as the Government of India is in action currently to create awareness among people, so that they can also be a part of this regime.

ACKNOWLEDGEMENT

Theauthors are grateful to the Principal, Govt. (Model) Science College, Jabalpur, Director, Zoological Survey of India, District Administration of Bastar and other resource person for their support during the study.

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Journal of Natural Resource and Development 16 (2) 44-54, 2021 | NAAS RATING : 3.77 | ISSN-0974-5033

STUDY OF BACTERIAL QUALITIES OF RAW MILK OF BUFFALO AND SHEEP

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Received : 05.03.2021 Accepted : 11.04.2021

ABSTRACT

Study of bacterial qualities of raw milk of Buffalo and Sheep was conducted at Chitrakoot–Satna (M.P.) during January to April 2020.All sanitary precautions were followed to produce clean milk. The samples of raw milk of three animals each were replicated ten times and tested to determine the standard plate count/mℓ (SPC) (10^4), lactic acid bacterial count/mℓ (LABC) (10^3), lipolytic bacterial count/mℓ (LBC) (10^2), proteolytic bacterial count/mℓ (PBC) (10^2) and coliform count in the raw milk. The data obtained for the aforesaid tests were subjected to statistical analysis. The results of the statistical analysis showed that the differences in mean values of SPC/mℓ 10^4, LABC/mℓ 10^3, LBC/mℓ 10^2, and PBC/mℓ 10^2. In view of the findings and results presented above, it may be concluded that the milk of all the animals was of superior quality, due to low bacterial counts and absence of coliform. The bacterial quality of milk of Buffalo was found superior than Sheep milk due to minimum bacterial count of SPC, LABC, LBC and PBC; and absence of coliform.

Key Words : *Raw milk, bacterial quality, buffalo and sheep.*

INTRODUCTION

Buffalo *Bubalus bubalis* is the name of the domesticated buffaloes. The farming of buffaloes has long been favored due to their efficient utilization of low-quality high-roughage diet ***(Larsson, 2009).*** resistance to parasites, quick and easy calf growth, good quality meat, and rich milk and milk products. Buffaloes are widely distributed throughout Asia, the Middle East, Europe, China, South America, the former Soviet Union Countries, and the Caribbean. However, the largest number of buffaloes and buffalo breeds are found in India and Pakistan producing 68% and 28% of the world buffalo milk production ***(IDF, 2010).***

Domestic buffaloes are raised in the regions with hot and humid climate, where cattle originating from tura cannot be raised. Buffaloes are resistant to many diseases being even genetically resistant to some ailments. **(Borriello *et al.*, 2006).**

Buffalo *Bubalus bubalis* milk plays an

important role in human nutrition particularly in the developing countries. Compared with CM, buffalo milk is richer in almost all the main milk nutrients. Also, some milk products such as Mozarrella cheese and ghee are the specialties of buffalo milk. In addition, a recent study ***(Sheehan and Phipatanakul, 2009).***

An average composition of buffalo milk is 87.2% water, 3.7% fat, 3.5% protein, 4.9% lactose and 0.7% mineral ooxides ***(McGraw Hill, 2005).***

The LAB consume natural milk sugars and release lactic acid that increases acidity, rendering milk proteins, especially casein, to denature and tangle into a solid mass or curd. They also cause the release of bioactive compounds which contribute to important physical, chemical and therapeutic properties of fermented milk products (***Van-Neil et al., 2002).***

Raw milk could be a source of undesirable or even pathogenic bacteria which implicated in milkborne diseases. A number of bacteria including S. aureus, Escherichia coli, Listeria monocytogenes and Salmonella have been recovered from raw milk and some of these have been determined to be pathogenic and toxicogenic, and implicated ***(De Buyser et al., 2001; Harrington et al., 2002).***

Micro-organisms may gain entry into raw cow's and buffalo's milk from various sources either directly from dairy animals experiencing sub clinical or clinical mastitis, or from faecal contamination, particularly around the teats, and from the farm environment particularly the water source and utensils used for the storage of milk on farm or during transportation ***(Oliver et al., 2005).***

Bacterial contamination of raw milk can originate from different sources: air, milking equipment, feed, soil, faeces and grass ***(Coorevits et al., 2008).*** The number and types of micro-organisms in milk immediately after milking are affected by factors such as animal and equipment cleanliness, season, feed and animal health ***(Rogelj, 2003).*** It is hypothesized that differences in feeding and housing strategies of cows may influence the microbial quality of milk ***(Coorevits et al., 2008).***

Most of the Sheep *(ovis aries)* milk produced throughout the world is transformed into cheese. Some sheep milk yoghurt is produced in Greece, however, fresh sheep milk is rarely consumed. For this reason, when we refer to the quality of sheep milk we are concentrating mainly on its capability to be transformed into high quality dairy products, and to produce high yields of these products from each litre of milk. This is often described as the processing performance of the milk. (***Aleandri 1990; Cavani et al., 1991).*** These are the renneting time, the rate of curd formation or rate of firming and the consistency of the curd. For this reason milk clotting properties have been widely used by researchers to assess the processing performance of milk.

The microbiological quality of milk may be affected by adulteration of milk, contamination during and after milking, mastitis, milking method, animal health, stage of lactation, season, feeding and the hygiene in the farm ***(Beldjil AAF,2013)***.

MATERIALS AND METHODS

The heard consociated of cross breed buffalo and only healthy cross breed sheep free from mastitis as detected by mastitis test and suffering from any infection or injuries were selected for this experiment. All animals were housed in one barn prepared for milking almost at two time. Animals were divided in two groups also sub-groups viz. Buffalo B_1, B_2, B_3 Sheep S_1, S_2, S_3. In all ten replications were made under each group. Udders were washed with 2 per cent potassium per magnate ($KmNO_4$) and two streams of fore milk from each quarter of Buffalo. Milk samples were tested for

determining the total bacteria determined by standard plate bacteria count and population density of four physiological group of bacteria viz. lactic acid bacteria count, lipolytic bacteria count and coliform bacteria count.

DURATION AND PLACE OF STUDY

The period of experiment was one month (January-April 2020). Milk were collected at the Mini Dairy Farm Rajaula Livestock Production and Management (Unit), Department of Natural Resource Management (NRM), Faculty of Agriculture, Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyalaya, Chitrakoot– Satna (Madhya Pradesh),

COLLECTION OF SAMPLE

Samples were collected from the milking pail separately in sterile 250ml conical flasks and plugged aseptically with cotton plug. The samples were brought immediately to laboratory for determination of total viable count as standard plate count (SPC) and their four physiological groups *viz.* lactic acid bacterial count (LABC), proteolytic bacteria count (PBC), lipolytic bacterial count (LBC) and coliform count(cc).

Distribution of Buffalos and Sheeps.

Buffalos no. : 100,101,102.

Sheeps no. : 400,401,402.

Buffalo			**Sheep**		
B_1	B_2	B_3	S_1	S_2	S_3
100	101	102	400	401	402

PARAMETERS OF STUDY

Following were the bacterial parameters determined as per method of

Chalmers 1953

i. Standard plate count/ml (SPC) for total bacteria
ii. Lactic acid bacterial count (LABC)
iii. Proteolytic bacterial count (PBC)
iv. Lipolytic bacterial count (LBC)
v. Coliform count (CC)

PREPARATION AND STERILIZATION OF GLASS WARES

CONICAL FLASKS

Prior to use all the conical flasks were thoroughly cleaned, dried, plugged with absorbent type cotton and then sterilized in an autoclave at 120°C for an hour.

PIPETTES

Prior to use all the bacteriological pipettes of 1 ml and 10 ml capacity were immersed in chromic acid solution overnight, washed with tap water and dried. They were wrapped in paper and sterilized in hot air oven at120 0C for an hour.

TEST TUBE

Test tubes were washed thoroughly with detergent and tap water. Then test tubes were used for preparing 9ml blanks of Ringer's solution for dilution of the sample. They were plugged with sterile absorbent cottonand then sterilized in autoclave at 120°C at 1.2 kg/cm2 for 20 minutes.

PETRI PLATES

These were thoroughly washed with detergent then tap water and kepton a clean table in inverted position for drying. Dried plates were wrapped in paper in block of 4 in each. These were sterilized in hot ovenat 120°C for an hour.

PREPARATION OF MEDIA FOR MICROBIALEXAMINATION OF MILK SAMPLES:

RINGER'S SOLUTION

It was needed for dilution of milk samples in desired ratio be foreplating as per **(Prasad and neeraj, 2004)**

COMPOSITION;

Sodium chloride (NaCl) - 9g
Potassium chloride (KCl) - 0.42g
Calcium chloride ($CaCl_2$) - 0.24g

Sodium bicarbonate ($NaHCO_3$) -0.20g
Distilled water - 1000 ml
*0.48 in case of hydrated salt, ($CaCl_2.6H_20$)

STANDARD PLATE COUNT (SPC) FOR TOTALBACTERIAL

COMPOSITION: Nutrient Agar medium
Agar-Agar - 15g
Peptone - 5g
Sodium chloride - 5g
Beef extract - 3g
Distilled water – 1000 ml
pH - 7.2

peptone, sod. Chloride (NaCl) and beef extract were dissolved in 1000mldistilled water and pH was adjusted to 7.2 at 60 0C using Bromothymolblue as indicator. Agar power was dissolved in 900 ml distilled water by steaming for 15 minutes and filtered peptone, NaCl and beef extract were added, then dispensed in to conical flasks, pulgged and sterilized in autoclave at 1.25 kg/cm2 for 20 minutes.

Lactic acid bacterial count (LABC)

LABC was determined in lactose agar medium.

COMPOSITION:
Agar-Agar - 15g
Peptone - 5g
Lactose - 20g
Beef extract - 3g
Andred's indicator – 10 ml
Distilled water – 1000 ml
pH - 7.0
Andred'sindicator- Acid fuschsin (0.05 % aq.soln) (50 mg in 100 mlwater).

PROTEOLYTIC BACTERIAL COUNT (PBC)

PBC was determined in nutrient milk agar medium
Nutrient agar – 1000 ml
Sterilized skim milk – 100 ml

20ml sterilized skim milk was added to200 ml of sterilized nutrient agarin conical flask of 250ml just prior to pouring in petri-plates. Afterincubation for 24 hours the development of clean hollow zone around the colonies in medium indicated the proteolysis by bacteria.

LIPOLYTIC BACTERIAL COUNT (LBC): DETERMINEDIN NILE BLUE SULPHATE AGAR MEDIUM

COMPOSITION:
Nutrient agar- 1000 ml
Melted butter fat – 40 ml
Nile blue sulphate indicator (0.1 % -10mlAqueous solution)
pH - 7.0

Nutrient agar was prepared melted butter fat and Nile blue sulphate indicator was added and placed in 250 ml capacity flasks. The medium was steamed for 30 minutes on each of three successive days for sterilization. At the time of use, medium was shaken vigorously and emulsifying fat globules. Lipolytic bacteria hydrolysed pink fat globules and produced a bluish colour around the beneath the colonies. The unhydrolysed fat globules appeared pink due to the action of Nile blue sulphate.

COLIFORMS COUNT

Coliforms were determind in MaConkey's Bile salt Agar medium **(Chalmers, 1953).**

COMPOSITION:
Sodium glycotaurocholate - 5g
Peptone - 20g
Sodium chloride (NaCl) - 15g
Agar-agar (powder) - 15g
Lactose - 10g
Bromocresol aquous solution - 2.5 mlpurple 1 %
Distilled Water – 1000 ml
pH - 7.2

The sodium taurocholate, peptone and sodium chloride were dissolved in1000 ml. distilled water by steaming for 30 minutes and pH adjusted to7.4 at 60 0C. Then agar-agar powder was

dissolved at 100 0C and filtered. Lactose and bromocresol powder purple indicator were added to the filtered solution and then plugged and sterilized as mentioned earlier.

STANDARD PLATE BACTERIAL COUNT (SPC/ml):

The following procedure was used for determination of SPC in milk:

1. Milk samples collected were shaken gently 25 times in back and forth motion on a levelled table, in a time of about 7 seconds.
2. Dilutions of agitated samples of milk were prepared with the help of sterilized 9 ml blank of ringer's solution such as 1: 10, 1: 100, 1: 1000.Care was taken to shake the diluted sample as stated above.
3. Sterilized pipettes were used to measure quantity of 1 ml suitable milk21
1. dilution and transferred to priorly marked sterilized petri plates in duplicates.
4. As the dilution was transferred into the petri dishes, the month of agar flasks were flamed safely and approximately 15 ml of nutrient agar medium was poured into each dish to cover about 3mm deep.
5. Agar medium was mixed with the dilution by gently rotating and tilting the dishes. After agar medium became solid, the plates were inverted and incubated for two days at 37 0C.
6. After lactation, those plates were selected which had 30 to 300 coloniesand counted with the help of Quebec colony counter. The average number of bacterial count on two plates were determined by multiplying it with dilution factor to determine bacterial number per ml of milk.

LACTATION PERIOD:

The incubation times for various physiological groups of bacteria were as follows:

Type of Bacteria	Temperature degree Celsius	Lactation Period
Standard plate count(SPC)	37	48 hr
Proteolytic bacterial count(PBC)	30	24 hr
Lipolytic bacterial count(LBC)	30	48 hr
Lactic acid bacterial count (LABC)	35	48 hr
Coliforms count (CC)	37	30 hr

Source of variation	d.f.	S.S.	M.S.S.	F.Cal. Value	F.Tab. (5%)	Result N/NS	C.D.
Group of sheep (T)	r-1	SS(r)	SS(r) df	Mss(r) Emss		S/NS	
Replications (R)	t-1	SS(t)	SS(t) df	Mss(t) Emss		S/NS	
Error	(t-1) (r-1)	SS(e)	SS(E)/Df				
Total	(rt-1)						

STATISTICAL ANALYSIS OF DATA:

The data on bacterial parameters of milk will tabulated and subjected to analysis of Technique (ANOVA) in RBD as per method to determine bacterial quality of milk.

ANALYSIS OF VARIANCE (ANOVA) FOR THE DATA:

Where,

R = Replication

T = Treatment

d.f.= Degree of freedom

S.S.= Sum of square

MSS = Mean sum of square

F.Cal. = Calculated value of F

F.Tab = Table value at 5% level of significance

Critical difference was calculated by following:

$$C.D. = \frac{\sqrt{2} \times EMSS}{r} \times t\ (5\%)\ \text{error d. F}$$

r

Where,

C.D.= Critical difference

EMSS = Error mean sum square

r = No. of replication

d.f.= t value at 5% for error degree of freedom.

RESULTS AND DISCUSSION

(1) Standard plate count/mℓ (SPC x 10^4)

Table 1.0 and Fig. 1.0 shows the data on Standard plate count/mℓ (SPC x 104) in raw milk of Buffalo and Sheep. The results obtained showed that the mean Standard plate count/mℓ (SPC x 10^4) in Buffalo milk was recorded 193.28, 201.48 and 209.68 with overall mean of 201.48 and the difference between the mean values was significant. The mean Standard plate count/mℓ (SPC x 10^4) in Sheep milk was recorded 188.10, 196.06 and 204.06 with overall mean of 196.07. The differences in these values were found non-significant due to animals was significant, whereas, the differences were non-significant due to replication. SPC was found lower in Sheep milk in comparison to Buffalo milk.

Table - 1.0 : Standard plate count/mℓ (SPC x 10^4) in Buffalo and Sheep Milk

S. No.	Replication	Buffalo (B)			Mean	Sheep (s)			Mean
		B_1	B_2	B_3		s_1	s_2	s_3	
1	R_1	35.60	32.00	33.40	**33.67**	32.60	35.00	31.20	**32.93**
2	R_2	36.00	32.20	33.60	**33.93**	33.00	35.20	31.50	**33.23**
3	R_3	35.60	32.00	33.50	**33.70**	33.20	35.00	31.40	**33.20**
4	R_4	35.50	32.40	33.60	**33.83**	32.80	34.80	31.50	**33.03**
5	R_5	35.50	31.80	33.60	**33.63**	32.80	34.50	31.20	**32.83**
6	R_6	35.40	31.80	33.60	**33.60**	33.00	34.80	31.40	**33.07**
7	R_7	35.40	32.00	33.80	**33.73**	33.00	34.60	31.00	**32.87**
8	R_8	35.20	32.00	33.80	**33.67**	32.80	34.80	31.40	**33.00**
9	R_9	35.40	31.80	33.80	**33.67**	33.20	34.80	31.20	**33.07**
10	R_{10}	35.40	32.00	34.00	**33.80**	32.40	34.60	31.50	**32.83**
Range	Minimum	35.20	31.80	33.40		32.40	34.50	31.00	
	Maximum	36.00	32.40	34.00		33.20	35.20	31.50	
	Mean	**35.50**	**32.00**	**33.67**	**33.72**	**32.88**	**34.81**	**31.33**	**33.01**
F- test					S				S
S. Ed. (±)					0.09				0.09
C. D. (P = 0.05)					0.19				0.19

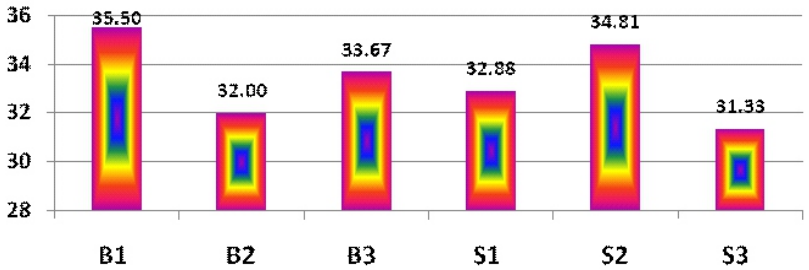

Fig. - 1.0 : Standard plate count/mℓ (SPC x 10^4) in Buffalo and Sheep Milk

(2) Lactic acid bacterial count/mℓ (LABC x 10^3)

The data on the Lactic acid bacterial count/mℓ (LABC x 10^3) in raw milk of Buffalo and Sheep is presented in Table 2.0 and Fig. 2.0. The results obtained showed that the mean Lactic acid bacterial count/mℓ (LABC x 10^3) in Buffalo milk was recorded 39.36, 38.04 and 36.86 with overall mean of 38.09 and the difference between the mean values was significant. The mean Lactic acid bacterial count/mℓ (LABC x 10^3) in Sheep milk was recorded 37.86, 39.16, and 36.64 with overall mean of 37.89. The differences in these values were found significant. However, differences in values due to replication were non-significant . LABC was found lower in Sheep milk (37.89) compared to Buffalo milk (38.09).

Table - 2.0 : Lactic acid bacterial count/mℓ (LABC x 10^3) in Buffalo and Sheep milk

Sl. No.	Replication	Buffalo (B)			Mean	Sheep (s)			Mean
		B_1	B_2	B_3		s_1	s_2	s_3	
1	R_1	39.20	38.00	37.00	**38.07**	37.80	38.80	37.00	**37.87**
2	R_2	39.40	38.20	37.20	**38.27**	38.00	39.20	37.00	**38.07**
3	R_3	39.20	37.80	36.80	**37.93**	37.60	39.00	36.60	**37.73**
4	R_4	39.40	37.80	36.80	**38.00**	37.60	39.40	36.60	**37.87**
5	R_5	39.20	37.80	36.80	**37.93**	37.80	39.00	36.60	**37.80**
6	R_6	39.50	37.80	36.80	**38.03**	37.60	39.40	36.60	**37.87**
7	R_7	39.40	38.00	37.00	**38.13**	37.80	39.20	36.60	**37.87**
8	R_8	39.50	38.20	36.80	**38.17**	38.00	39.20	36.60	**37.93**
9	R_9	39.60	38.60	37.00	**38.40**	38.40	39.40	36.60	**38.13**
10	R_{10}	39.19	38.21	36.38	**37.93**	38.00	39.00	36.20	**37.73**
Range	Minimum	39.19	37.80	36.38		37.60	38.80	36.20	
	Maximum	39.60	38.60	37.20		38.40	39.40	37.00	
	Mean	**39.36**	**38.04**	**36.86**	**38.09**	**37.86**	**39.16**	**36.64**	**37.89**
F- test					S				S
S. Ed. (±)					0.08				0.10
C. D. (P = 0.05)					0.17				0.22

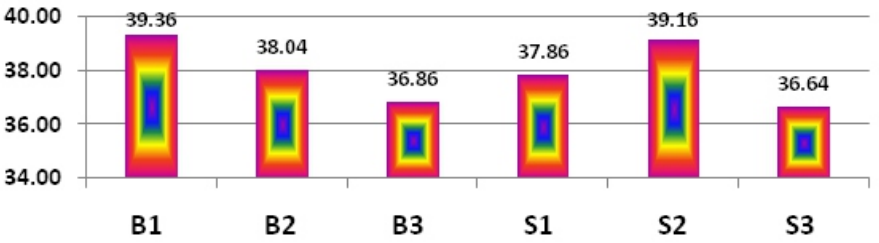

Fig. - 2.0 : Lactic acid bacterial count/mℓ (LABC x 10^3) in Buffalo and Sheep milk

(3) Lipolytic bacterial count/mℓ (LBC x 10^2)

The data on the Lactic acid bacterial count/mℓ (LABC x 10^3) in raw milk of Buffalo and Sheep is presented in Table 3.0 and Fig. 3.0. The results obtained showed that the mean Lactic acid bacterial count/mℓ (LABC x 10^3) in Buffalo milk was recorded 39.36, 38.04 and 36.86 with overall mean of 38.09 and the difference between the mean values was significant.The mean Lactic acid bacterial count/mℓ (LABC x 10^3) in Sheep milk was recorded 37.86, 39.16, and 36.64 with overall mean of 37.89. The differences in these values were found significant. However, differences in values due to replication were non-significant. LABC was found lower in Sheep milk (37.89) compared to Buffalo milk (38.09).

Table - 3.0 : Lipolytic bacterial count/mℓ (LBC x 10^2) in Buffalo and Sheep milk

Sl. No.	Replication	Buffalo (B)			Mean	Sheep (s)			Mean
		B_1	B_2	B_3		s_1	s_2	s_3	
1	R_1	40.50	38.80	39.60	**39.63**	39.40	37.50	38.40	**38.43**
2	R_2	41.50	38.80	39.40	**39.90**	40.20	37.60	38.40	**38.73**
3	R_3	41.50	38.80	39.50	**39.93**	40.20	37.60	38.40	**38.73**
4	R_4	41.00	38.40	39.40	**39.60**	39.80	37.40	38.50	**38.57**
5	R_5	40.80	38.60	39.60	**39.67**	40.00	37.50	38.50	**38.67**
6	R_6	42.00	39.00	39.40	**40.13**	40.20	37.80	37.80	**38.60**
7	R_7	41.00	38.20	39.60	**39.60**	39.80	37.60	38.40	**38.60**
8	R_8	41.00	38.60	39.80	**39.80**	40.00	37.20	38.20	**38.47**
9	R_9	41.00	38.40	39.40	**39.60**	39.80	37.40	38.20	**38.47**
10	R_{10}	41.20	37.80	39.20	**39.40**	40.00	36.80	38.20	**38.33**
Range	Minimum	40.50	37.80	39.20		39.40	36.80	37.80	
	Maximum	42.00	39.00	39.80		40.20	37.80	38.50	
	Mean	**41.15**	**38.54**	**39.49**	**39.73**	**39.94**	**37.44**	**38.30**	**38.56**
F- test					S				S
S. Ed. (±)					0.14				0.11
C. D. (P = 0.05)					0.29				0.24

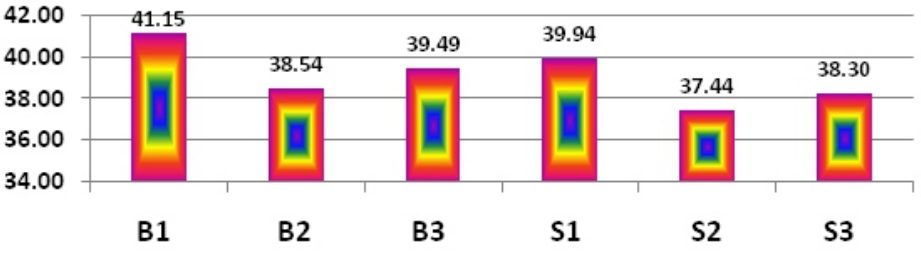

Fig. - 3.0 : Lipolytic bacterial count/mℓ (LBC x 10^2) in Buffalo and Sheep milk

(4) Proteolytic bacterial count/mℓ (PBC x 10^2)

The data on the Proteolytic bacterial count/mℓ (PBC x 10^2) in raw milk of Buffalo and Sheep are shown in Table 4.0 and Fig. 4.0. The results obtained showed that the mean Proteolytic bacterial count/mℓ (PBC x 10^2) in Buffalo milk was recorded 35.50, 32.00 and 33.67 with overall mean of 33.72 and the difference between the mean values was significant.The mean Proteolytic bacterial count/mℓ (PBC x 10^2) in Sheep milk was recorded 32.88, 34.81 and 31.33 with overall men of 33.01. The differences in these values were found significant. However, differences in values due to replication were non-significant. PBC was found lower in Sheep milk (33.01) compared to Buffalo milk (33.72).

Table - 4.0 : Proteolytic bacterial count/mℓ (PBC x 10^2) in Buffalo and Sheep milk

S. No.	Replication	Buffalo (B)			Mean	Sheep (s)			Mean
		B_1	B_2	B_3		s_1	s_2	s_3	
1	R_1	35.60	32.00	33.40	**33.67**	32.60	35.00	31.20	**32.93**
2	R_2	36.00	32.20	33.60	**33.93**	33.00	35.20	31.50	**33.23**
3	R_3	35.60	32.00	33.50	**33.70**	33.20	35.00	31.40	**33.20**
4	R_4	35.50	32.40	33.60	**33.83**	32.80	34.80	31.50	**33.03**
5	R_5	35.50	31.80	33.60	**33.63**	32.80	34.50	31.20	**32.83**
6	R_6	35.40	31.80	33.60	**33.60**	33.00	34.80	31.40	**33.07**
7	R_7	35.40	32.00	33.80	**33.73**	33.00	34.60	31.00	**32.87**
8	R_8	35.20	32.00	33.80	**33.67**	32.80	34.80	31.40	**33.00**
9	R_9	35.40	31.80	33.80	**33.67**	33.20	34.80	31.20	**33.07**
10	R_{10}	35.40	32.00	34.00	**33.80**	32.40	34.60	31.50	**32.83**
Range	Minimum	35.20	31.80	33.40		32.40	34.50	31.00	
	Maximum	36.00	32.40	34.00		33.20	35.20	31.50	
	Mean	**35.50**	**32.00**	**33.67**	**33.72**	**32.88**	**34.81**	**31.33**	**33.01**
F- test					S				S
S. Ed. (±)					0.09				0.09
C. D. (P = 0.05)					0.19				0.19

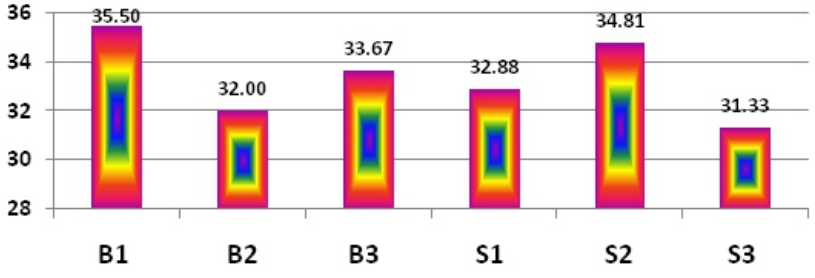

Fig. - 4.0 : Proteolytic bacterial count/mℓ (PBC x 10^2) in Buffalo and Sheep milk

(5) Coliform count/mℓ (CC)

Coliform was not present in any of the samples of Buffalo and Sheep milk, which indicated that the quality of milk was superior and the management of Dairy Farm was very good.

The results of the investigation regarding the bacterial qualities of milk of Buffalo and Sheep have been presented in tables, graphically represented, and discussed in the preceding chapters.

Results of the experiment are summarized below:

1. Standard plate count/mℓ (SPC x 10^4) was recorded lower in the milk of Sheepwhile Buffalo milk contained higher SPC.
2. Lactic acid bacterial count (LABC x 10^3) was found lowerin the milk of Sheep, where as,it was found higher in Buffalo milk.
3. Milk of Sheep recorded lower Lipolytic bacterial count (LBC x 10^2) in comparison to Buffalo milk.
4. Lower Proteolytic bacterial count (PBC x 10^2) was recorded in milk of Sheep, where as, the milk of Buffalo contained higher PBC.
5. Coliform was not found in any of the samples of Buffalo and Sheep milk, which indicate that the bacterial quality of milk of all the animals was superior and the management activities of the Dairy were good.
6. The differences in values of SPC, LABC,LBC and PBC were significant, while the differences in values due to replication were non-significant.
7. Based on the above results, the bacterial quality of milk of Sheep was found superior over Buffalo milk.

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Journal of Natural Resource and Development 16 (2) 55-60, 2021 | NAAS RATING : 3.77 | ISSN-0974-5033

IMPACT OF ADVERTISEMENT ON CONSUMER BUYING DECISION: A STUDY OF FAST-MOVING CONSUMER FOOD PRODUCTS

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Received : 19.06.2021 Accepted : 15.07.2021

ABSTRACT

The study was conducted in Jammu city for analyzing the effect of advertisement on buying decisions of consumers towards Fast Moving Consumer Goods (FMCG). The primary data for the study were collected through a structured questionnaire from a sample size of 100 respondents with a random sampling technique. The study revealed that the consumers remembered mostly the tagline of the advertisement. About 55% of consumers thought that advertisement was somewhat necessary for decision making. The rest 45% of consumers relied on advertisement for buying decision. In addition, 37% of consumers purchased a product just by getting motivated by the advertisement. The technique of Garret ranking showed that among the various aspects shown in an advertisement, the quality of the product was given the 1st rank by the consumers. About 60% of consumers preferred TV as a medium of advertisement. Besides, the use of music was considered to be an important factor in an advertisement.

Keywords : *Consumer, quality, advertisement, product*

INTRODUCTION

The Fast-moving consumer goods (FMCG) sector in India has grown at an average of about 11% over the last decade. India's prosperous economic growth and growing household incomes are expected to increase consumer spending to US$ 3.6 trillion by 2020. The fast-moving consumer goods (FMCG) sector is an essential contributor to India's GDP growth. Currently, the FMCG industry is the fourth largest sector in the Indian economy and it contributes to employment to around 3 million people. Over the years, the Indian FMCG sector has been expanding at a healthy pace on account of growing disposable income, booming youth

population, and increasing brand consciousness among consumers. Globally, India is becoming one of the most appealing markets for foreign FMCG players due to the easy availability of imported raw materials and cheap labor costs. The metropolitan segment is the biggest contributor to the growth of the Indian FMCG sector, accounting for around two-thirds of the total revenues. However, the share of suburban and rural segments in the country's FMCG sector is likely to increase by the end of 2020 (Anonymous,2017).

An advertisement is an article in a newspaper, on television, on the internet, or in a public place, which tries to convince the customer to buy something, or which gives information to the viewer about an event Advertisement is any form of non-personal communication through mass media that is paid for by a recognized sponsor(s). Advertisements are done everywhere on towering signs along highways, on the radio, on social media, on television, in email, and on website pop-ups. Although ads influence people in various ways, they tend to catch essentially everyone's attention to some degree even subconsciously, and sometimes prompt a response (Kotler, 2002). The advertisements play a critical role in introducing a fresh product to the list & making a better choice during shopping. One of the research revealed that the customers after watching an advertisement wanted to buy the new brand introduced in the market; they thought that T.V. advertisements helped them to make a better choice during shopping (Kotwal et al., 2008). Advertising is the action of calling public consideration to something, especially by paid announcements. Advertising is a major tool that is used properly by marketing managers which helps enable them to sell products, services, and ideas (Rajagopal, 2006). TV advertisement is effective in taking the attention of customers, creating interest, desire, and action of purchasing (Ansari and Joloudar, 2011). Therefore the need for high preference for advertising was highlighted for companies that want to retain their market and take positive steps to amplify their market share (Ayanwale et al., 2005).

Due to the advancement in technology and increases in internet data usage, digital platforms have become the most attractive media to promote and advertise products. Customers that are exposed to the web page or social media platforms containing a banner advertisement are more likely to remember that advertisement and product (Danaher and Mullarkey, 2003). Although, online advertisement can help marketers to increase sales but continuous and unwanted banners and pop-ups can lead to a negative effect. Several studies have reported that consumers hate advertisements, especially those that pop up, and sometimes feel violated and irritated by their presence (Wegert, 2002). The celebrity endorser is a magic potion for marketing any product or brand. Today, it's a frequently used approach in marketing and for brand building (Khatri, 2006). The progress of brand loyalty is predicated on the expansion of customer-brand bonds. The challenge for marketers is to build up and foster the bonds that can strengthen brand loyalty (Leahy, 2008). The rural consumers attach more importance to the advertisement and are more influenced by advertisement as compared with urban costumers (Rodge, 2001).

Pope, (2009) stated that through advertisements customer behavior is shaped and they motivate to buy such products. The researchers found that repetition in the advertisement hit the mind of the customers which also helps them to keep in mind that product and purchase repeatedly. Advertisements are the source of motivation that forces them to buy a particular product and it is also a

source of building trust. Bisht (2014) found that there is a positive relationship of emotional response with consumer buying and TV Advertisements. TV advertising affects the buying behavior of teenagers related to different residential backgrounds (i.e., rural and urban) and gender groups (i.e., male and female). Advertisements on TV influence the trial of the product by the customer.

Thus, references show that advertisement in various forms has a lot of influence in the market and marketers follow advertisement as an important issue in marketing management or strategy. Given the above, an attempt has been made in this exercise to analyze the effect of advertisement on the buying behavior of the consumers.

MATERIALS AND METHODS

The research was conducted in Jammu city (32.7014° N, 74.8596° E) of Jammu district of Jammu & Kashmir (UT), India during 2018. The Sampling unit consists of all customers of FMCG food products who visited retail outlets such as EasyDay, Big Bazaar, Monika Super Market, and Vermani Shopping in Jammu city. Convenient random sampling was used and the sample size consisted of 100 respondents that were taken for study and analysis. Pretested and well-structured schedule was used to collect the data from consumers.

After collecting the data, the results were analyzed by using the Percentage analysis & Garrett ranking technique, etc.

2.1.Percentage analysis

$$\text{Percentage} = \frac{x}{y} \times 100$$

Where x = number of respondents respond

y = total number of respondents

2.2. Henry Garret ranking technique

In this technique, the percentage position of each rank obtained was converted into scores by referring to the table given by Henry Garret. Then for each factor, the scores of individual respondents were added together and divided by the total number of respondents for whom the scores were added.

Formula:

Percentage position=100(Rij-0.5)/n

Where Rij is the rank

N=number of items

RESULTS AND DISCUSSION

3.1. Effect of Advertisement on consumer towards choosing a brand

Table 1 regarding the advertisement effect revealed that 35% of consumers agreed that advertisement affects the choice of their brand, 30% of consumers were strongly agreed that advertisement affects the choice of their brand, 19% of consumers were neutral whereas only 16% of consumers disagreed with the statement. Sometimes advertisements, especially visuals, have a long-lasting impression on the viewers and customers instantly recall the advertisement while doing shopping or purchasing. Regarding recall of advertisement, it shows that 75% of consumers recall the advertisement whereas 25% of consumers don't. Marketing or Advertising companies focus on various aspects of an advertisement such as theme, color, tagline, celebrities, etc while promoting a product. All these can help the potential consumer to remember the advertisement. The table also revealed the aspect of advertisement that consumers remember the most. 40% of consumers remember the tag line of the advertisement, 20% of consumers remember the color of the advertisement, 20% of the consumers remember the theme of the advertisement and 20% of the consumers remember the celebrity face in the advertisement.

Table - 1 : Effect of Advertisement on consumer towards choosing a brand

Affect of Advertisement on consumer towards making a choice on brand	No. of respondents	Percentage
Strongly Agree	30	30
Agree	35	35
Neutral	19	19
Disagree	16	16
Strongly Disagree	0	0.00
Recall the advertisement		
Yes	75	75
No	25	25
The aspect of the advertisement consumer remember the most		
Colour	20	20
Tag Line	40	40
Theme	20	20
Celebrity	20	20

3.2. Reliability on Advertisement for buying decision

Table 2 revealed that 45% of consumers sometimes rely on advertisement for their buying decision, 35% of consumers said yes they rely on advertisement for their buying decision, 15% of consumers said they rarely rely on the advertisement and 15% of consumers said no they don't rely on advertisement for their buying decision. The table regarding the purchase of a product just by getting attracted to the advertisement revealed that 37% of consumers said yes they purchase a product just by getting attracted to the advertisement, 33% of consumers said that sometimes they purchase a product just by getting attracted to the advertisement, 19% of consumers said that no they don't purchase a product just by getting attracted to the advertisement and 11% of consumers said they rarely purchase a product just by getting attracted to the advertisement.

3.3. Rank wise ranking of factors highlighting in an advertisement affecting consumer preference towards a brand

Table 3 regarding the product feature factors affecting consumer preference towards brand represents the rank-wise ranking of factors using Garret ranking. Quality of the product was ranked 1st, followed by features of the product 2nd. Price of the product was ranked 3rd, Offers on the product was ranked 4th, Use of the product was ranked 5th, followed by Necessity of product was ranked 6th. Opinion of an expert about the product was ranked 7th, followed by Brand endorsers at 8thrank. Entertainment was ranked 9th, followed by Celebrity endorsement which was ranked10th.

Table - 2 : Reliability on advertisement for buying decision

Reliability on Advertisement for buying decision	No. of respondents	Percentage
Yes	35	35
No	15	15
Sometimes	45	45
Rarely	15	15
Purchase a product by getting attracted to the advertisement		
Yes	37	37
No	19	19
Sometimes	33	33
Rarely	11	11

Table - 3 : Garret ranking of factors highlighting in an advertisement affecting consumer preference towards a brand

[Garret Ranking] Factors	Total	Average Score	Rank
Price of the product	3790	37.9	3rd
Features of the product	3980	39.8	2nd
Brand endorsers	2960	29.6	8th
Offers	3610	36.1	4th
Quality of the product	4130	41.3	Ist
Use of the product	3590	35.9	5th
Necessity of Product	3460	34.6	6th
Opinion of an expert about the product	3060	30.6	7th
Celebrity	2460	24.6	10th
Entertainment	2880	28.8	9th

3.4. Response to the popular media of the advertisement, repeated advertisements, and the importance of music in an advertisement

Advertising agencies use different media of advertisement for promoting a product. Table 4 shows the various popular sources of advertisement among consumers. The data shows that majority of the consumers i.e.60%, like TV as a medium of advertisement. Internet and social media marketing are also gaining popularity and around 23% of consumers like the Internet as a medium of advertisement. Continuously repeating ads can sometimes irritate the viewers and can adversely affect the buying decision of the potential customers. Table 4 also revealed that 35% of consumers get irritated by repeated advertisement, 31% of consumers change the channel due to repeated advertisement, 23% of consumers give no response to repeated advertisement and only 11% of consumers give response to a repeated advertisement. As different advertisements got popular, because of their jingles, theme songs, and music, the respondents were also asked about the importance of music in an advertisement. The table shows that 55% of consumers said that music is somewhat important in the advertisement, 35% of consumers said music is very important in advertisement and 10% of consumers said music is not important in the advertisement. Hence, we can say that music plays a vital role in the popularity and overall impact of an advertisement.

Table 4: Response to the popular media of the advertisement, repeated advertisements, and the importance of music in an advertisement

Medium of advertisement	No. of respond	Percentage
TV	60	60
Radio	3	3
Newspaper	13	13
Magazine	1	1
Internet	23	23
Response to a repeated advertisement in TV/Radio		
Yes	11	11
No	23	23
Get irritated	35	35
Change the channel	31	31
Importance of music in an advertisement		
Very important	35	35
Somewhat important	55	55
Not important	10	10

CONCLUSION

The study shows that the advertisement influences the buying decision of the customer to a large extent. It was also found that among various factors, consumers always maintain a tagline in their minds. The majority of the customer was of the view that music added more value for effective advertisement. Garret ranking showed that quality highlighting as a product feature in an advertisement ranked 1stwhich was followed by series of other factors like features of the product, price of the product, offers, use of the product, the necessity of the product, opinion of experts, brand endorsers, entertainment, celebrity respectively. The study also revealed that TV remains the most powerful and

effective medium for the advertisement of any goods among consumers.

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