

Survey of nature and extent of damage caused by bird pest to *pearl millet* crop in Patan District (North Gujarat)

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ABSTRACT:

Pearl millet is the main crop of Patan district of Gujarat state. It is grown in two seasons viz. *kharif* and summer. This research was conducted during 2005 and 2006 at Hansapur village of Patan district. Two varieties viz. Usha-23 and Pioneer of pearl millet were sown for study purpose. During this research work, bird pests were identified, and nature of damage and assessment of losses in grain yields were carried out. The bird species observed visiting the pearl millet crop at sowing and germinating stages were House Crows (*Corvus splendens*), Blue Rock Pigeons (*Columba livia*), Cattle Egret (*Ardea alba*), Grey Francolin (*Francolinus pondicerianus*) Dove (*Streptopelia decaocto*), Red - wattled Lapwing (*Vanellus indicus*), Common Myna (*Acridotheres tristis*), Bank Myna (*Acridotheres ginginianus*), Common Babbler (*Turdoides caudatus*), and Yellow-eyed Babbler (*Chrysomma sinense*). Blue Rock Pigeon, House Crow and Grey Francolin were found damaging the germinating seeds of pearl millet. The bird damage in germinating seeds of pearl millet varied from 7.50 to 9.35 (Mean=8.35%) and 4.28 to 8.87 (Mean=6.05%), respectively during summer, 2005-06 and *kharif*, 2005-06. The birds visited fields sown with pearl millet during morning hours i.e., from 6.00 to 10.00 a.m. and again in the evening from 4.00 to 6.00 p.m. but some times House Crows, Common Babbler occasionally visit the crop during noon time. The birds damaged 6.99 and 11.99 per cent of earheads during summer season and 6.96 and 18.00 per cent during *kharif* season in the treatment of manual bird scaring and unprotected (control) plots of pearl millet, respectively. The avoidable loss in grain yield of pearl millet varied from 8.87 to 15.73 during summer and 24.17 and 36.70 per cent during *kharif* season, in the treatment of manual bird scaring and unprotected (control) plots, respectively.

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INTRODUCTION

Patan district is situated in the northern part of Gujarat state. It is bound on the northwest and north by rann of Kutch and Banaskantha district. Patan district lies between 23° 41' to 23° 55' N latitude and 71° 31' to 72° 20' E longitude. Pearl millet (*Bajara*) *Pennisetum typhoides* is an important cereal heavily depredated by birds. Seed of this crop is exposed and so attract several bird species during the entire period of seed setting to harvesting stage and so suffer heavy losses. Birds may be insectivorous or granivorous, but they have a significant impact on the production of millet crops (Mathew et al., 1998). The pearl millet is highly susceptible to bird damage in northwest India (Beri et al., 1968; Mehrotra and Bhatnagar, 1979 and Dhindsa et al., 1984).

The extent of bird damage to the pearl millet varies between fields and at different localities depending upon several factors (Mathew et al., 1998). Crop fields attract many birds from sowing to grain maturity stage (Bhalodia et al., 1997). Various species of bird pests affecting different stages of growth to pearl millet was studied. Further, the nature and extent of damage was also studied and analysed in this work.

MATERIALS AND METHODS

Survey for the bird pests of pearl millet crop and assessment of damage in cultivators' field were conducted during 2005 to 2006 at Hansapur village in Patan district. Hansapur village lies between 23° 50' N latitude and 71° 09' E longitude. The fields having crop of pearl millet were randomly selected at each site. Birds visiting pearl millet fields were observed using a binocular (8-16 X 40), and counted twice in a day during the crop season. The observations were recorded for one hour duration. Birds were identified as per the descriptions of birds given by Ali and Replay (1983, 1987).

In April 2005, fourteen villages which constituted a major belt for this crop in Patan district were surveyed. The varieties grown in this area were Usha-23, and Pioneer. To estimate the amount of crop loss from each of the above three plots an area of each plot measuring 6 X 4.5m was marked in fields sown with above stated cultivars of pearl millet.

Method of recording observation

1. Number of seeds per row damaged/ eaten by birds during seedling stage. Total number of

seeds sown and no. of seeds damaged or eaten by birds per row in the net plot area after germination were ascertained by counting number of plumules left behind by the Frankolin.

2. Total number of ear heads per row were counted and recorded at the time of tillering stage.
3. Number of ear heads sowing bird damage was sorted out and recorded.
4. Ear heads damaged by insects were sorted out from the total ear heads nipped from a plot were counted and recorded separately.
5. After counting the ear heads damaged by birds and insects were, then sun dried and threshed separately. The grains were cleaned and weighed separately and recorded. Similarly, undamaged ear heads were sun dried and threshed; then cleaned grains were weighted and recorded separately.
6. Birds present in each plot were observed at different stages *viz.*, seedling and milk, dough, maturity stage, harvesting stage and recorded in each plot.
7. During *kharif* and summer seasons of 2005-2006, following treatments were evaluated.
 - i. Nylon net enclosure
 - ii. Manual bird scaring
 - iii. Control (Unprotected).

RESULTS AND DISCUSSION

Results of the field survey carried out regarding the bird species in *kharif* and summer seasons (2005-2006) damaging pearl millet variety Usha-23 and Pioneer in Patan district are given in Table-1.

The birds visiting fields sown with pearl millet were classified into three groups based on their food habits namely (i) useful (feeding on insect, pests, rats, molluscs etc.), (ii) harmful (feeding on grains) and (iii) facultative (feeding on grains when insect and other animal origin food was not available). These bird pests visit the crop during morning hours i.e., from 6.00 to 10.00 a.m. and again in the evening from 4.00 to 6.00 p.m. but some times House Crows, Common Babbler occasionally visit the crop during noon time.

Damage to the crop was initiated after the first irrigation, immediately after the sowing, when the seeds get soaked and the activity of the embryo starts. At this stage, bird pests were recorded infesting the crop, picking the soaked seeds from the soil and feeding on



them. Feeding on the moist seeds by Blue Rock Pigeon was limited for three days after sowing, till the germination of the seeds, but House Crows continue to infest the crop even after the emergence of plumule and radicle from the seed, and were observed feeding on the young seedlings by pulling them out from the soil and feeding on the remaining portion of the food material left in the seed.

Grey Francolin were visited in groups and disturbed sown and moist seeds and feeding on them. Young seedlings were damaged by removing the arial portion and feeding on the remaining food material present in the seed.

The results presented in **Table 1 and 2** revealed that the bird damage in germinating seeds of pearl millet varied from 7.50 to 9.35 (Mean=8.35%) and 4.28 to 8.87(Mean=6.05%), respectively during summer,2005-06 and *kharif*, 2005-06. Since the experimental plot was located in the farm area, where other plant breeding material of pearl millet crop were also sown and at germinating stage, bird scaring was employed in those plots which were adjacent to this plot. Hence due to the impact of bird scaring, the bird pests were less and so the damage is not significant, otherwise the damage could be more.

Bird pests at earhead stage and assessment of loss

Observations for the bird fauna infesting pearl millet crop, nature and extent of damage by the bird pests were recorded in the experimental

plots. The scaring employed was by human shouting in treatment 1. In treatment 2, limited (6.00m X 4.5m) area of the crop was enclosed with nylon net to prevent bird damage to the earheads. In the treatment 3, crop was kept without netting and bird scaring. The damage by bird pests to the pearl millet crop was assessed by taking counts of the total number of earheads, no. of healthy earheads and earheads at the time of harvest in each plot were noted separately which is given in **Table 3 and 4**.

Results given in the table 3 revealed that the pearl millet earheads were completely protected from bird damage when crop was enclosed in nylon net during both the seasons. On the other hand, bird damage was higher in unprotected earheads (135=11.99%) than that in the plot where manual bird scarring was employed (80=6.99%). Interestingly, insect damage was higher (107=9.99%) in nylon netting than those without netting (Treatment 1 =2.01% and Treatment 3 =3.02%) during summer season.

More or less similar trend of bird and insect damage was observed during *kharif* season also.

The number of undamaged earheads of pearl millet differed greatly among various treatments and as such maximum numbers of undamaged earheads were harvested from plot covered with nylon nets during both the seasons (Table 3 & 4), it was however, higher in summer season(964/plot) than *kharif* season(619/plot). Whereas, minimum undamaged earheads were

Table 1: Percentage of damage to pearl millet seedling by bird pests in summer 2005-2006

Plot No.	Plot size in	Variety	No. of rows in each plot	Av. No. of seeds in each row	Total No. of seeds in each plot	No. of seeds damaged	Damage to germinating seeds(%)
1.	6.00m X 4.5m	Usha-23	10	62	620	58	9.35
2.	6.00m X 4.5m	Usha-23	10	61	610	50	8.20
3.	6.00m X 4.5m	Usha-23	10	60	600	45	7.50
Mean			10	61	610	51	8.35

Table 2: Percentage of damage to pearl millet seedling by bird pests in *kharif* 2005-2006

Plot No.	Plot size in	Variety	No. of rows in each plot	Av. No. of seeds in each rows	Total No. of seeds in each plot	No. of seeds damaged	Damage to germinating seeds(%)
1.	4.00 X 4.5m	Pioneer	10	62	620	55	8.87
2.		Pioneer	10	63	630	27	4.28
3.		Pioneer	10	58	580	29	5.00
Mean			10	61	610	37	6.05

Table 3: Assessment of damage to pearl millet ear head stage at the harvesting stage during summer 2005-06

Treatment	Area	Total No. of ear heads	No. of healthy ear heads	No. of ear heads damaged by		Ear head damage (%) by	
				Bird	Insect	Bird	Insect
1. Manual bird scaring	6.00m X 4.5m	1144	1041	80	23	6.99	2.01
2. Enclosed in nylon net	6.00m X 4.5m	1071	964	00	107	0.00	9.99
3. Control (Unprotected)	6.00m X 4.5m	1126	956	135	34	11.99	3.02
Mean		1113.67	987	71.67	54.67	6.33	5.01

Table 4: Assessment of insect and bird damage to pearl millet ear heads at the harvesting Kharif 2005-06

Treatment	Area	Total No. of ear heads	No. of healthy ear heads	No. of ear heads damaged by		Ear head damage(%) by	
				Bird	Insect	Bird	Insect
1. Manual bird scaring	6.00m X 4.5m	618	526	43	49	6.96	7.93
2. Enclosed in nylon net	6.00m X 4.5m	688	619	00	69	00.00	11.14
3. Control (Unprotected)	6.00m X 4.5m	550	429	99	22	18.00	5.13
Mean		618.67	524.67	47.33	46.67	8.32	8.10

found in plots exposed without bird scaring in summer season(956/plot) which in turn was higher than that found in *kharif* season (429/plot).

The percentage of earheads damaged due to birds differed greatly and as such the earheads were completely free from bird damage in the plots covered by nylon net. Maximum bird damage was found in earheads from the plots exposed without bird scaring (11.99 %) in summer season(Table 3). Similar experiment was conducted in *kharif* 2005-2006. The percentage of damage to the pearl millet earheads was 18.00 per cent as shown in table 4. During this period, large area surrounding the experimental plot was under cultivation with crops like pearl millet, sorghum, pulses and cotton. The bird pests were observed visiting and damaging the above mentioned crops, with the results that the percentage of damage was reduced in the experimental plot.

In summer and *kharif* (2005-2006) pearl millet experiment was conducted to study the yield loss. For this purpose, the crop was raised on an area of one acre and the trial consisted of three treatments, *viz.* crop exposed with bird scaring, crop enclosed with nylon net but without bird scaring . The manual bird scaring was

employed in terms of loud human shouting in treatment one. In treatment two, limited area (6m X 4.5m) of the crop was enclosed with nylon net to prevent bird damage to the earheads, in order to assess the yield under fully protected condition. In treatment 3, the crop was totally unprotected *i.e.* without nylon netting and bird scaring as well.

Assessment of avoidable losses in yield of pearl millet grains was calculated in terms of kilogram per hectare as well as percentage shown table 5 and 6.

As per the observation recorded Rose ringed Parakeet and House Crows are the bird pests which cause damage to the pearl millet crop at the milky and dough stage of the crop. They damage the earhead by cutting and removing the sheath (husk), thus exposing the grains. These birds infest the crop during morning hours *i.e.* from 6.00 to 10.00 a.m. and again in the evening from 4.00 to 7.00 p.m. They either visit the crop singly or in groups of 10 to 25.

Perusal of results (Table 5) revealed that the highest grain yield of pearl millet was registered in the crop protected by nylon net (2837.03 kg/ha) whereas, minimum grain yield was recorded in unprotected plots which suffered heavy bird depredation (2390.73 kg/ha) during summer, 2005-

**Table 5: Assessment of loss in yield of pearl millet (cv.Usha-23) grains by bird pests during summer 2005-06**

Treatment	Area in	Grain yield(kg)		Avoidable loss in grain yield (%)
		Per Plot	Per ha	
1. Manual bird scaring	6m X 4.5m	6.980	2585.18	8.87
2. Enclosed in nylon net	6m X 4.5m	7.660	2837.03	0.00
3. Control (Unprotected)	6m X 4.5m	6.455	2390.73	15.73

Table 6: Assessment of loss in yield of pearl millet (cv. Pioneer) grains by bird pests during kharif 2005-06

Treatment	Area in	Grain yield(kg)		Avoidable loss in grain yield (%)
		Per Plot	Per Plot	
1. Open and with bird scaring	6m X 4.5m	3.45	1277.77	24.17
2. Enclosed in nylon net	6m X 4.5m	4.55	1685.18	00.00
3. Control (Unprotected)	6m X 4.5m	2.88	1066.66	36.70

06. Manual bird scaring provided some protection against bird damage and as such the grain yield was some what higher (2585.18 kg/ha) than that of unprotected plots. The avoidable loss was minimum (8.87%) in plots protected against birds by manual scaring, whereas, it was maximum in unprotected plots (15.73).

More or less similar trend of bird damage was observed during *kharif* 2005-06 in pearl millet (Table 6). The highest grain yield of pearl millet was registered in the crop protected by nylon net (1685.18 kg/ha), whereas, minimum grain yield was recorded in unprotected plots which suffered heavy bird depredation (1066.66 kg/ha) during summer, 2005-06. Manual bird scaring resulted in some protection against bird damage and as such the grain yield was some what higher (1277.77 kg/ha) than that of unprotected plots. The avoidable loss was minimum (24.17%) in plots protected against birds by manual scaring, whereas, it was maximum in unprotected plots (36.70%).

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