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INHIBITING DAMAGE OF WATERMELON (*Citrulus lanatus*)AGAINST SOME BIRD PESTS IN AN ORCHARD OF FAISALABAD, PAKISTAN

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ABSTRACT

Present paper provides information on reducing the watermelon damage by using the distress sound player. As it is ranked as an important nutritional fruit crop of Pakistan, it is subjected to an intensive depredation by common myna (*Acridotheres tristris*), house crow (*Corvus splendens*) and house sparrow (*Passer domesticus*) in the unprotected conditions, causing not only severe damage but resultant economic losses. At the unguarded seedling stage, the damage was 1.192±0.023, and in protected with sound player it remained 0.200±0.014, while protected at foliage, flowering and mature stages, it remained as low as 0.130±0.007, 0.155±0.010, and 0.138±0.020, showing its effectiveness. It, therefore, suggests that use of this repellent can avert the damage not only on watermelon, but for other fruit crops, and by and large incorporation of mechanical and that the use of similar mechanical repellents, would be useful to inhibit the damage and restrain serious and economically important bird depredations on the sustainable horticultural and agricultural crops in Pakistan.

Key words: Watermelon, Bird pests, Damage, Repellents .

INTRODUCTION

Importance of watermelon (*Citrulus lanatus*) is evident due to its high nutritive value throughout the world (Simmons *et al*. 2010). Watermelon belongs to the family *cucurbitaceae* and is widely cultivated in different regions of the world. (Jones, 2003). Impact of invasive vertebrates, including a variety of avian pests viz. house crow, common myna and house sparrow, have been reported to cause a substantial damage to natural resources, deteriorate crop quality, induce crop diseases, damage livestock and, therefore, prove to be ecologically harmful to agricultural and horticultural practices (De Grazio,1978; Nakamura, 1999; ICAR Annual Report,2009; Witmer *et al*., 2009).

In Pakistan, various economically important cucurbit crops are produced annually during summer, and of these, watermelon assumes to be highly significant with enriched protein, carotenoids and lycopean with an antioxidant potential (Edwards *et al*., 2003; Melger *et al*., 2008). As such, it is grown from April through August and no cultivation in winter (Diane *et al*. 1994). Predominantly growers in Southern United States and rest of the world make their best attempts to nurture it in summer to provide with important nutrients and minerals (Bolin and Brandenberger, 2001).

Some cultural techniques have been well used to manage watermelon against weeds and squash bugs in alternate planted rows (Weed and Conradi, 1920). Herbicide weed control for watermelon using a broad spectrum weed control program PREE, has resulted in a useful control in various regions of the world (Umeda *et al*. 1998), while chemically, watermelon fruit flies have deficient due to their hidden feeding behaviour, and likely to disrupt with its growth potential (Dhillon *et al*. 2005; Roesslar, 1989). Information on resistance of muskmelon (*Cucumic melo*) for the melon fruit fly (*Bactocera cucarbitae*) and manifesting with its chemical control using diptrex, and malathion for 15 days spray, inhibited the depredations on the growth stages in Dera Ismail Khan, Pakistan (Khan and Musakhal, 1999). Watermelon and allied fruits in Pakistan are seriously affected by several birds and insects not only lowering their quality, but also reducing their production, mainly without any pertinent management measures (Mahmood *et al*., 2005). Apart from large and small mammals viz. deer, rats and mice, and the wolves, birds as crows and parakeets, also bring about an intensive damage to watermelon at different growth stages in the unprotected conditions (Tracy, 2004).

Efficiency of vertebrate pest management among complex faunal communities is reported to have an adverse impact on non-targeted species, and the basic criteria for their effectiveness is, therefore, always based on accurate selection and targeted action in an agricultural based system approach (Bangson *et al.,*2008). Availability of cucurbit crops throughout the world range more than 26 thousand hectors and of these, watermelon accounts for more than 70%, both in open fields and system using hybrid cultivators from green houses, covered with polyethylene to reduce any chance of contamination (Doherty and Mizelles, 2001). Impact of high intensity management also includes using trickle irrigation, black plastic mulch, occasionally insecticides and fungicides on its growth performance at differential

stages and high management practices improve the quality of fruit to marketable commercial size (Lu *et al*., 2003). Aims and objectives of the present studies were, therefore, to survey a watermelon field in an urban garden and to estimate the depredations incurred by various bird pests at various growth stages, and to determine the impact of distress sound player in minimizing the visitations by the depredating birds, and to compare the difference in terms of the damage from unprotected conditions.

MATERIALS AND METHODS

Present studies were focused on reducing the watermelon (*Citrulus lanatus*) damage from seedling to mature fruit stage by three bird pests viz. the common myna (*Acridotheres tristris*), house crow (*Corvus splendens*) and house sparrow (*Passer domesticus*) in an one acre of a total five acre urban garden at square no. 32, in the agricultural landscape of University campus, using a high pitched distress sound player, a mechanical repellent, for eight weeks (March through April, 2011). Other fruits existing in the present fruit farm were citrus, mango, guava, eugenea species, dates and mulberry in varying dimensions.

Of the four growth stages, the seedling, foliage, flowering and mature, effect of three birds was examined for a period of two hours (120 minutes), each in the morning and evening durations. For a better damage assessment, all the observations were further sub-divided in to 15 minutes intervals in the two periods (morning and evening). Observations were extended for both unprotected (control) and protected conditions (incorporated with distress sound player), used for fruit crop management, and both morning and evening sections were compared for assessing the efficiency of sound player to reduce bird attacks, on different watermelon growth stages. A distress sound player, simply an auto-reversed audio tape, equipped with a chargeable battery to run for more than 14 hours and can broadcast alarm calls uninterruptedly of some fearsome animals to scatter away the birds from a particular crops. The obtained data was subjected to Kolmogrov statistical analysis for determining the Normality range of distribution to interpret the results meaningfully.

RESULTS AND DISCUSSION

a. Seedling and foliage stages: The three birds viz. common myna, house crow and sparrow, recorded for their depredations on four growth stages of watermelon, it was apparent that for both seedling and foliage stages, with a only eight days break, the birds continued with their depredatory attacks in the morning and evening hours in the unguarded conditions. Therefore, there appeared to be no numerical and statistical predominance for them, and damage remained comparable in both the day long periods. For the guarded conditions with the distress sound player placed outside the watermelon field, there was a considerable (about 30%) decrease in terms of their depredations (Figs. 1,2).

b. Flowering and mature stages: For both flowering and mature stages of watermelon, with the development of fruit and being more nutritive, for the unprotected conditions, numbers of all three birds damage increased substantially, possibly exhibiting a high predilection, and invariably no feed choice probability in terms of their degree of depredation was recorded (Fig. 3). With the distress sound player installed beside the orchard fruit, a marked reduction took place in the attacks of three birds, not only averting the damage but also economic losses (Fig. 4). Similarly, for the mature stage of watermelon in unprotected and protected conditions, it was evident that, crows and sparrows inflicted with more tenacious damage, but in sound player protected conditions, it was reduced significantly, again emphasizing on its important protection against birds (Fig. 4).

A statistical comparison between unprotected and protected conditions using the Tuckey's (t-test) shows that invariably all three birds were statistically significant for their feeding efficiency on watermelon with a strong correlation for their depredations on seedling stage. It was reasonably lower for damage with the application of a distress sound player (Table 1; Fig. 5), while evaluating the same for the foliage stage, it was plausible that the damage proportions were much reduced in the protection phase for the fruit, and that for the remaining two stages, the depredations remained fairly high in unguarded situation, and was of lower intensity with the inception of a distress sound player. Statistical comparison of means for all the growth stages of watermelon indicated that, there occurred highly significant ($P<0.01$) differences among bird depredations in the vulnerable conditions, whereas, the differences remained non significant in the sound player protected conditions, showing its effectiveness against the bird attacks.

Present studies amply proved that being an important nutritional crop, it is subjected to an intensive damage by the three bird pests, at different growth stages, to cause a substantial damage and resultant economic losses in the unguarded conditions. Damage becomes tenacious when there is no protection by any means, and that the birds attack and destroy it unabatedly. As the depredations were more apparent during the morning and evening durations, with almost a quiescence at mid day, possibly time required by birds for a break on nearby temporary roosts, but their depredations seemingly became apparent closer to the sunset, to consume the fruit

more before reverting to their roosts to spend night. It is worth referring that, more damage was inflicted on the flowering and mature stages, indicating their predilection. Although some attempts have been made for bird management in orchards (Bomford and Brien,1990; Braysher, 1993; Sinclair, 2000; Braysher and Saunders, 2002), incorporating various management practices.

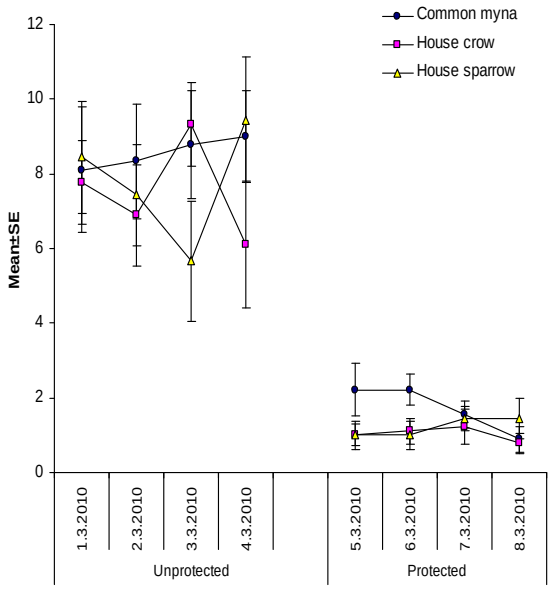
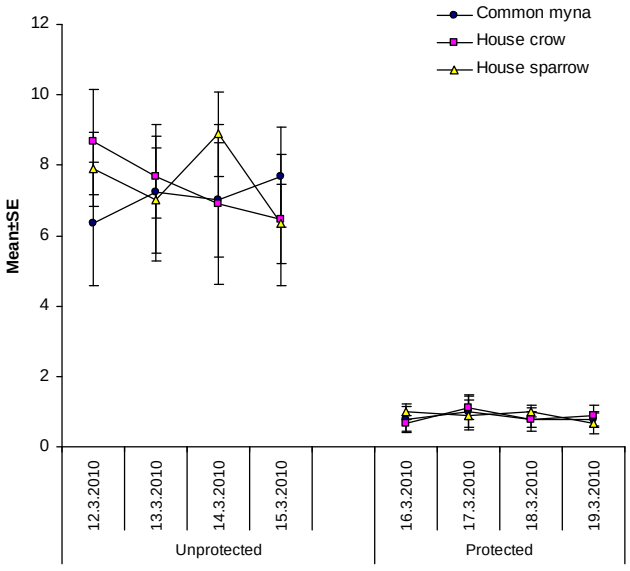
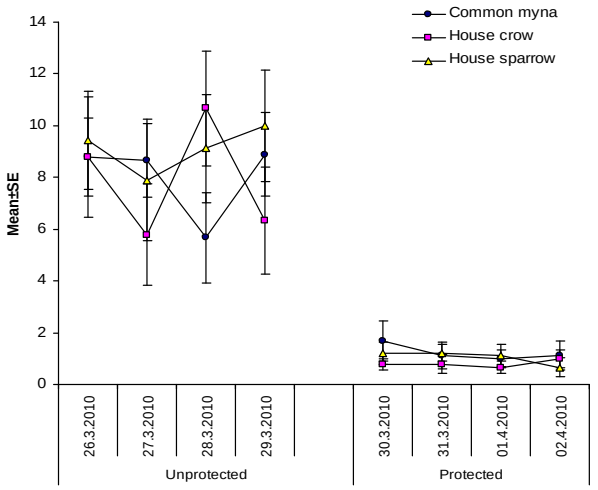


Fig. 1. Comparison between unprotected and protected conditions at the seedling stage for bird depredations in watermelon.



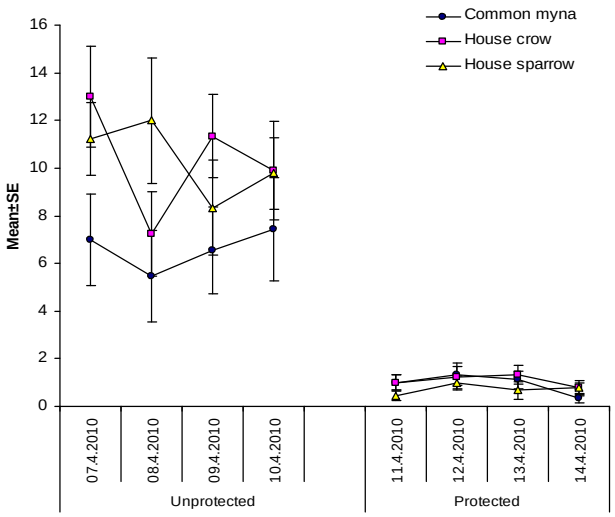
Foliage stage

Fig. 2. Estimation of unprotected and protected fruit conditions at the foliage stage for three birds.



Flowering stage

Fig. 3. Estimation of comparison between unprotected and protected phases for the sampled fruit.



Mature stage

Fig. 4. Number of birds recorded in visitations at maturity stage in the unguarded and protected conditions of the fruit.

Use of a high frequency distress sound player besides the watermelon fruit with intermittent relay of fearsome sounds, reduced the damage and resultant economic losses, by much less visitations of the three birds in the fruit crop. The fact that both birds and also insects cause intensive damage to this crop also depend on the crop susceptibility, and the degree of fortification provided. Presently, adopting a non chemical approach for management of pests seems more plausible, as the mechanical repellents, without burdening the already highly contaminated agro-ecological systems through injudicious and unwise chemical control manifestations of various crops and pests (Stevens and Clarke, 1998). Importance of repellents becomes more rational in

Pakistan, where they can be useful to avert the impact of toxic pesticides and maintain the sustainability of crops in the green agro-ecosystems with an ecological pest management approach (Khan *et al*. 2011).

Table 1. Statistical comparison of means for damage percentage by birds on different growth stages of watermelon.

Fruit Stage	Condition		Mean
	Unprotected	Protected	
Seedling	1.192±0.023 b	0.200±0.014 d	0.696±0.188 A
Foliage	1.097±0.028 c	0.130±0.007 d	0.614±0.183 B
Flowering	1.250±0.048 b	0.155±0.010 d	0.702±0.208 A
Maturity	1.365±0.070 a	0.138±0.020 d	0.751±0.234 A
Mean	1.226±0.032 A	0.156±0.009 B	

Means sharing similar letter in a row and a column are statistically non-significant (P>0.05). Small letters represent comparison among interaction means and capital letters are used for overall mean.

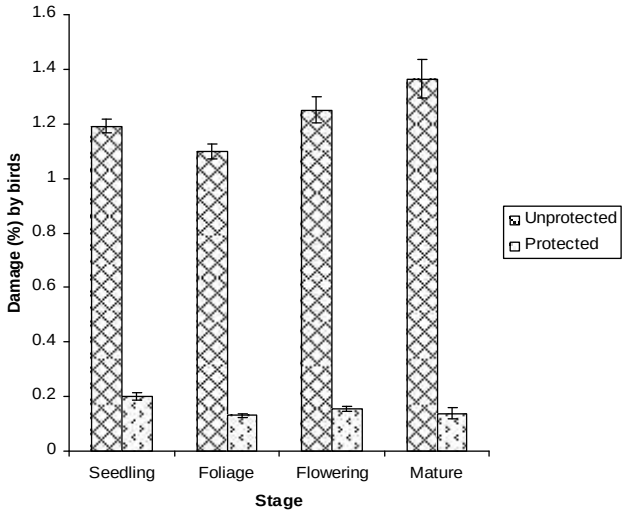


Fig. 5. Damage percentage recorded by three birds at various watermelon growth stages

Importantly, effectiveness of a particular management device (repellent) largely depends on its mode of placement and adjudging the population of a pest species, availability of food crops near their roosts and the distance required by birds to travel per visit to feed (Swihart, 1992). A successful role played by the non- chemical method to minimize the bird damage problems on different crops has been reported by (Vogt, 1997; Glahn and Wilson, 1992; Fiedler *et al* 1991), and more importantly, the successful applications of mechanical repellents depends on their cost effectiveness, which should be much less than the net crop remunerations, and if so, desirable results for management of pests are likely to be achieved.

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