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INHIBITING THE HOUSE CROW (*Corvus splendens*) DAMAGE ON MAIZE GROWTH STAGES WITH REFLECTING RIBBONS IN A FARMLAND

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ABSTRACT

Present paper provides information on minimizing the damage caused by the house crow (*Corvus splendens* L) on the developmental stages (dough and mature) of maize in an irrigated cropland using the reflecting ribbons. Of all observations per three arbitrarily divided three field stations. For the unprotected conditions, highest damage 15.36±0.74 occurred towards the left hand side, and the lowest, 3.97±0.24 was recorded in the middle of the field. In the ribbon protected conditions, both highest and lowest damages were 1.43 and 0.73, for the left hand side and middle of the crop, thereby, considerably reducing the crow depredations. Present studies also augment that, use of reflecting ribbons and allied non chemical repellents, would not only diminish damage from a variety of birds on economically important crops, but also prevent economic losses, to maintain ecological stability and sustainability in the productive agro-ecosystems of Pakistan.

Key words: house crow, maize, damage, repellents, management.

INTRODUCTION

Maize (*Zea mays* L) is one of the staples of Pakistan, and ranked as third cereal after wheat and rice also plays a major role in Pakistan's food economy, both in terms of production and consumption. Due to its high importance, emphasis has always been laid on its production, procuring wheat at administratively set prices to support farming communities and subsidizing wheat sales to flour mills and directly to consumers with the objective of stabilizing prices at levels affordable to consumers (Ashfaq *et al*. 2001). Throughout Asia, the house crow (*Corvus splendens* L) is well established in the communal roosts in the rural and urban habitations, not only causing damage, but substantial economic losses (Ryall, 1994; Peh and Sodhi, 2002). Maize crop occurs in four stages viz. seedling, flowering, dough and mature and intensive damage has been recorded on both dough and mature stages, when more fluid is present in them in the developing kernels, and predominantly feeding on leaves (Dhindsa and Saini, 1994; Reddy, 1998).

The Indian house crow also inhabits a wide range of habitats throughout Pakistan, particularly in Central Punjab, Pakistan (Roberts, 1991; Khan and Jabeen, 2007; Qureshi *et al*. 2010). The house crow is a serious agricultural pest and as such, destroys various crops at their different growth stages, with maize being as one of its preferred food item, and also inflicts losses to the biodiversity and sustainable ecosystems (Dilshan *et al*. 1982; Gourami, 1985; Simberloff, 1996; Khan, 2003). Scanty information is available on the spread of house crow in Mauritius and the adjoining areas despite this, the crow has been occurring as an avian pest in the local farmlands and a control program using a chemical, starlicide, a repellent, has proved effective to inhibit the crow and other bird damage (Puttoo and Archer, 2003). Although agriculture remains important throughout the world, it also augments in various pestiferous bird populations (Sakai *et al*. 2001). Communal roosting is well recognized amongst the members of the *corvids* family, as in Queensland, Australia, the radio tagged adults, seemed to prefer same roost for many years, while the juveniles were rarely faithful in establishing a particular roost (Everding and Jones, 2006). The house crow exploits light timbered plantations and also lives in a close association with man in many village sides, towns and urban environment, where it more spoils the food crops rather consuming and, therefore, causes economic losses (Ryell, 1994; Khan, 2003; Yap and Sodhi, 2004). Depredatory attacks inflected a loss of about 65.1 % on sprouting sunflower in Ludhiana, India, and treatment with repellents, 0.5% thiram and 0.5% copper oxychloride, reduced damage by 15%. Dhindsa *et al*. (2003) using some toxic agents, successfully inhibited the crow damage by only 10%, but with a severe impact on non-targeted crops. Bird invasions on crops with availability of sufficient moisture are always a major environmental concern due to adverse impact on biodiversity and economics (Lim *et al*. 2003).

Studies on avian ecology have remained rather poor in the tropical urban areas due to increase in the forest plantations (Lim and Sodhi, 2004). Seed treatment to manage house crow infestations on wheat in spring season using six repellents, evaluated from 2004 through 2007 proved significantly effective to prevent crow damage and reduce but at least one product , Banoctine, provided with a poor control , while other treatments

including repellants did not reduce the damage significantly (Kennedy and Connery, 2008). Present studies were, therefore, aimed at reducing the intermittent crow visitations and damage by the installation of reflecting ribbons, due to their glossy and shining mirror image during the daylight hours, and the resultant economic losses in an irrigated farmland, and thus, prove beneficial to the farmers. It was, therefore, hypothesized that, depredations of house crow would be inhibited due to the installation of shiny reflecting ribbons at dough and mature stages of maize to reduce the damage and inhibit economic losses.

MATERIALS AND METHODS

Present studies were conducted on two maize growth stages viz. dough and mature for a period of eight weeks from April through May, 2010 on a one acre field in an irrigated farmland of Faisalabad using the multi-mirror reflectors. Observations were extended in both unguarded and protected (with multi-mirror reflectors) conditions. Maize field was equally sub-divided in to three field corners viz. left, middle and right (Crabb *et al*., 1997) for a better crow damage assessment. Observations were made consecutively for two hours each in the morning and evening sessions. Of a total 110 maize plants, 37 each were present on the left and right, while 36 occurred in the middle. Sample sizes for all three sides were represented by four randomly selected plant rows at dough stage with each comprising 270 plants. Of them, 90 selected plants were further randomized and paper tagged. In all, 270 plants per three field corners on the dough and mature stages were examined for crow damage in the protected and unprotected conditions. For the mature stage, five mature cobs were randomly selected and the numbers of kernels inflicted with crow damage were visually counted as compared to the intact cobs. Data was statistically analysed using the t- test for comparison of two different means for a randomized experiment.

RESULTS AND DISCUSSION

Studies extended on crow damage on the unguarded and guarded maize stages, dough and mature, for eight weeks represent that, an overall damage for the unguarded conditions of maize on the dough and mature stages remained increasingly higher on the left and right field corners, while it was relatively less in the middle, while in the protected conditions with the mirror reflectors, it was increasingly low, due to the shining and glossy rotating mirrors largely inhibited the crow depredations (Table1; Fig. 1). Comparing the morning and evening damage proportions per three field blocks also indicated a highly significant ($P<0.01$) and comparable depredations for both maize growth stages in the unprotected conditions, while it was reasonably lower ($P>0.01$) in the guarded conditions (Table 2; Fig. 2).

Considering the damage between both dough and mature stages for three sub-divided field blocks for dough and mature stages of maize, tenacity of damage both in terms of unprotected and protected conditions remained comparable (Table 3; Fig. 3), as it was significantly higher in unguarded and sufficiently low in unguarded conditions, while no apparent difference would be made for the crow damage for three field blocks in the morning and evening durations (Fig. 4).

Data of the present studies significantly reported that, house crow assumes to be one of the important vertebrate pests of agricultural farmlands of Central Punjab, which invariably also acts as the hub of agriculture in Punjab. For both the maize growth stages, the damage in the unprotected conditions remained significantly higher and invariably of the similar magnitude in both morning and evening durations. The arbitrarily and equally sub-divided maize field visibly to augment the crow depredations, suffered more destruction than in the middle, perhaps due to the fact that, the birds preferred consuming on the corners of the field to escape at early on than being in the middle of the field. Crow depredations become more apparent in the dough stage of this crop and assume alarming proportions at maturity (Barry *et al*. 2003; Lavey *et al*. 2003).

The house crows due to a broad feeding niche, not only cause a damage to crops but also inflict serious losses on household and stored grains items (Roberts, 1991; Bruggers *et al*. 1998). Other potentially important avian pests viz. rose-ringed parakeet (*Psittacula krameri*), house sparrow (*Passer domesticus*) and common myna (*Acridotheres tristris*), also cause a considerable damage to both maize and wheat crops besides, the orchard fruits, resulting in substantial economic losses (Khan and Beg,1998; Ahmad *et al*. 2012). Studies on bird-resistance in crops have focused on corn, grain sorghum, sunflower and rice, and their crop protection methods involve feeding behavior of granivorous birds and their effectiveness depends on the availability of preferred alternate foods such that, bird-resistant traits provide protection to the crop when other food choices occur; however, when alternate food is scarce or high bird populations create serious feeding competition, they prove to be less effective (Bullard, 1988). Crow damage intensifies at both dough and mature stages when crop remains devoid of any protection, and results in economic losses (Reddy, 1998; Wildlife Crop Damage Manual, 2001).

Another important aspect in present studies was the shorter distance of the crow roost from the maize field (less than half a kilometer), which triggered several crow visitations to and from the field, with a considerable less expenditure of energy. Presumably larger roost distances

from the food source would inhibit frequent food source visits per day (Everding and Jones, 2006). Installation of multi-mirror reflectors for seven continuous days, largely dispelled the house crow depredatory visits to the maize field, producing a sharp and shining image on crop. Following their removal from the field, crow movement patterns in the maize restarted after a short hiatus, which further signified the pestiferous abilities of the crows to inflict damage and economic losses. Similar reports (Mabb, 1997; Harms and Eberhard, 2003; Gordo, 2006; Ahmad *et al*. 2012), also point out that, bird pests incur a considerable damage to food crops. Management measures include a considerable focus from ecologists to improve both the quality and production of various crops without altering with the sustainable ecosystems (Schroder *et al*. 2002). Effectiveness and tenacious nature of a particular repellent predominantly depends on the skill which is required to place it in a particular field to acquire appropriate dividends (Swihart, 1992).

Present studies reported similar results with those of Dolbeer *et al*.(1998), Beg *et al*. (1995) and Khan *et al.*, (2011) who successfully incorporated a variety of repellents on various crops to repel different bird pests. Efficiency of mechanical repellents has worked well in Australasian, European and North American regions, while in Pakistan, its effectiveness remains scanty and, therefore, requires further studies to do away with the bird pests' menace to food sources, and inhibit the prevalent damage and accompanying economic losses to maintain crop quality and production.

Table 1. Overall Damage recorded for Unprotected and Protected conditions of Maize in an Irrigated Farmland in Faisalabad.

	Condition	N	Mean	SE	t-value	Prob.
Left	Unguarded	168	15.36	0.74	18.57**	0.000
	Guarded	168	1.43	0.10		
Middle	Unguarded	168	3.97	0.24	12.89**	0.000
	Guarded	168	0.73	0.06		
Right	Unguarded	168	13.39	0.66	18.34**	0.000
	Guarded	168	1.26	0.08		
Damage	Unguarded	168	1.64	0.07	20.03**	0.000
	Guarded	168	0.17	0.01		

** = Highly significant (P<0.010)

Table 2. A Comparison of crow damage for Maize in unprotected and protected conditions in the morning and evening durations in the farmland.

Time	Field station	Condition	N	Mean	SD	SE	t-value	Prob.
Morning	Left	Unguarded	84	15.76	7.06	0.77	18.05**	0.000
		Guarded	84	1.60	1.38	0.15		
	Middle	Unguarded	84	4.14	2.98	0.32	10.23**	0.000
		Guarded	84	0.71	0.75	0.08		
	Right	Unguarded	84	13.58	6.18	0.67	17.86**	0.000
		Guarded	84	1.33	1.14	0.12		
	Damage	Unguarded	84	1.67	0.65	0.07	20.83**	0.000
		Guarded	84	0.18	0.09	0.01		
Evening	Left	Unguarded	84	14.95	11.68	1.27	10.68**	0.000
		Guarded	84	1.26	1.30	0.14		
	Middle	Unguarded	84	3.80	3.36	0.37	8.12**	0.000
		Guarded	84	0.75	0.73	0.08		
	Right	Unguarded	84	13.20	10.36	1.13	10.59**	0.000
		Guarded	84	1.18	1.01	0.11		
	Damage	Unguarded	84	1.60	1.17	0.13	11.25**	0.000
		Guarded	84	0.16	0.11	0.01		

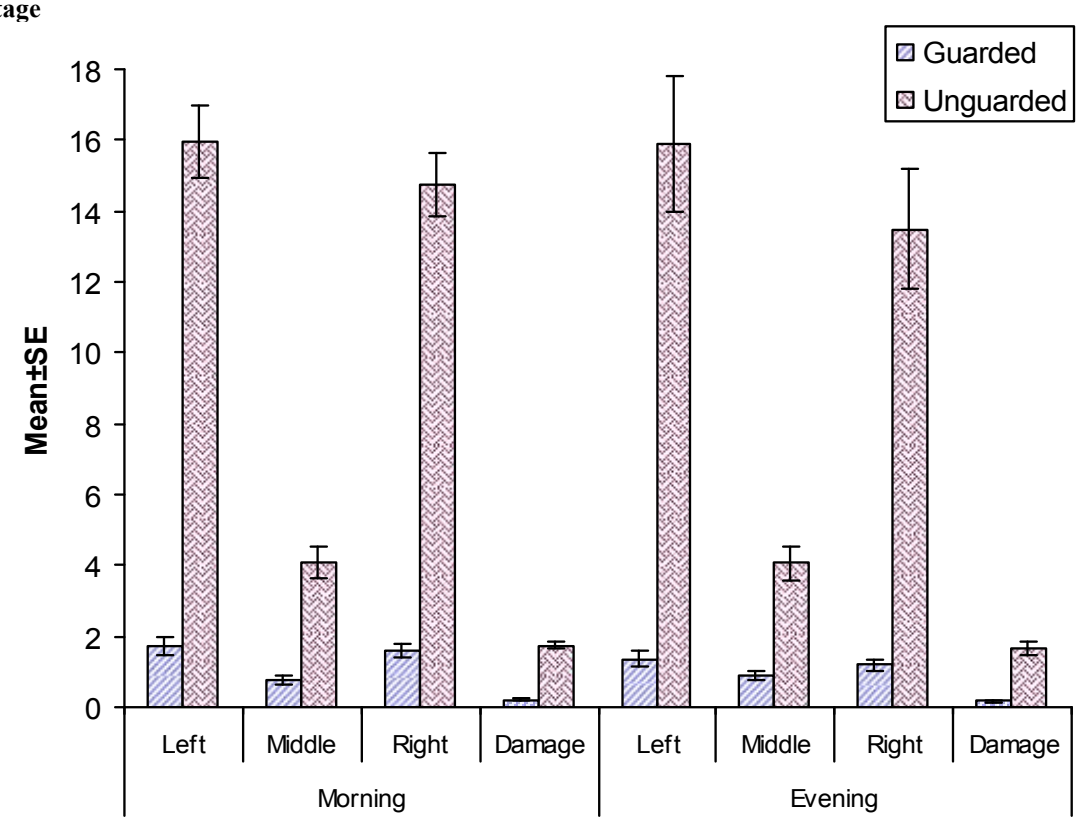
** = Highly significant (P<0.01)

Table 3. Assessing house crow depredations for growth stages in the unguarded and guarded (multi-mirror reflectors) conditions.

Stage	Field station	Condition	N	Mean	SD	SE	t-value	Prob.
Dough	Left	Unguarded	84	15.90	9.92	1.08	13.12**	0.000
		Guarded	84	1.55	1.47	0.16		
	Middle	Unguarded	84	4.08	2.93	0.32	9.79**	0.000
		Guarded	84	0.85	0.77	0.08		
	Right	Unguarded	84	14.11	8.82	0.96	13.09**	0.000
		Guarded	84	1.39	1.18	0.13		
	Damage	Unguarded	84	1.70	0.98	0.11	14.02**	0.000
		Guarded	84	0.19	0.11	0.01		
Mature	Left	Unguarded	84	14.81	9.35	1.02	13.12**	0.000
		Guarded	84	1.31	1.21	0.13		
	Middle	Unguarded	84	3.86	3.40	0.37	8.54**	0.000
		Guarded	84	0.62	0.69	0.08		
	Right	Unguarded	84	12.68	8.17	0.89	12.88**	0.000
		Guarded	84	1.12	0.95	0.10		
	Damage	Unguarded	84	1.57	0.90	0.10	14.36**	0.000
		Guarded	84	0.15	0.08	0.01		

** = Highly significant (P<0.01)

Dough stage



Mature stage

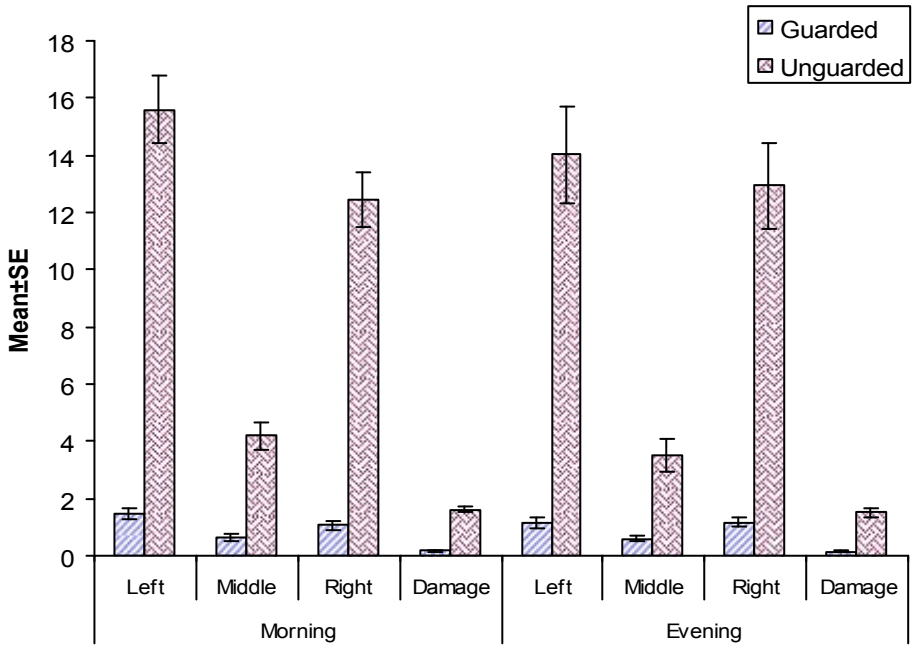


Fig. 1. A Comparison between an overall damage for unprotected and protected conditions of maize in an agricultural farmland.

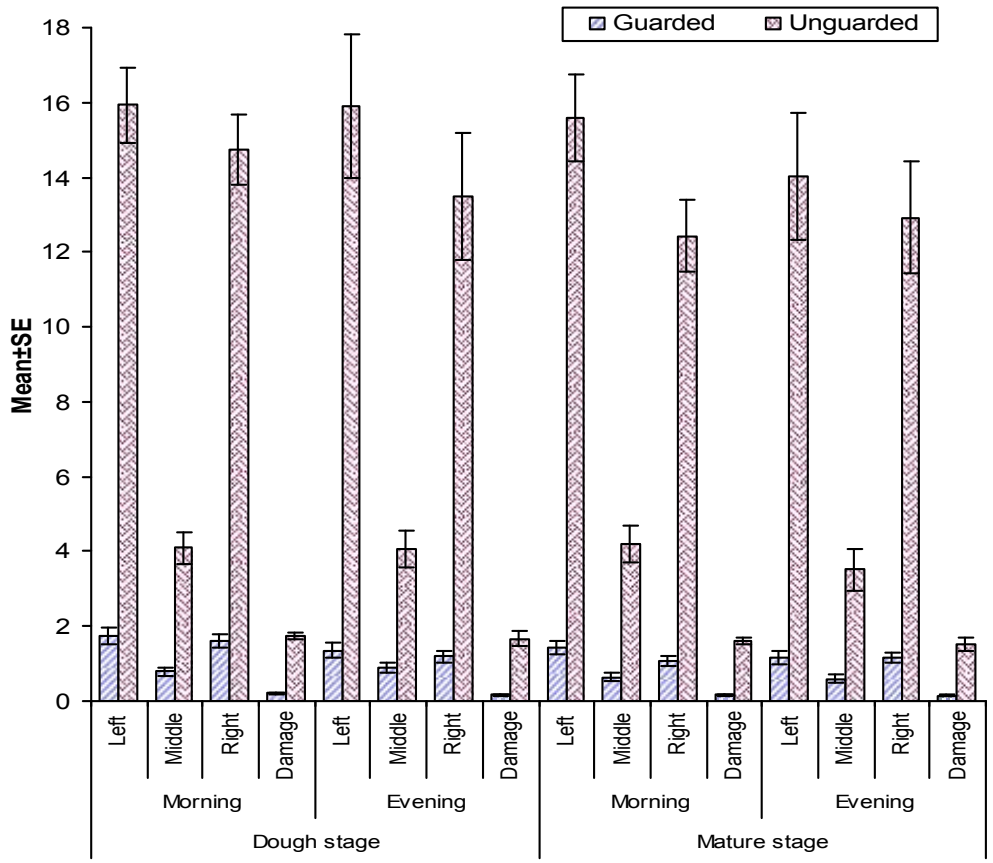


Fig. 2. Evaluation of maize damage at dough and mature stages in unguarded and guarded (with multi-mirror reflectors) conditions.

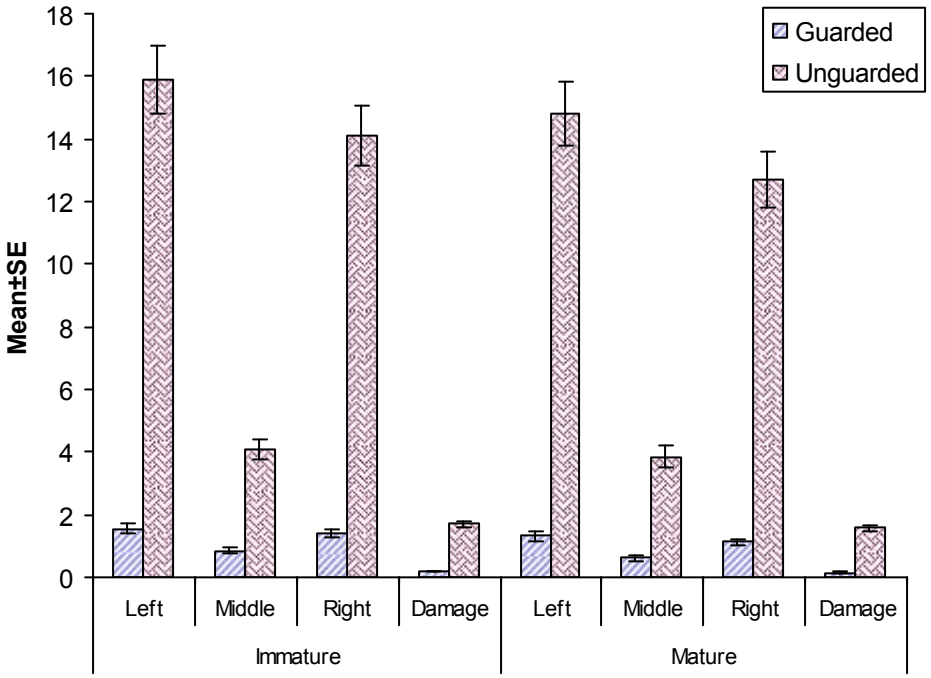


Fig..3. Comparison between unguarded and guarded conditions at dough and mature stages with an overall damage proportions.

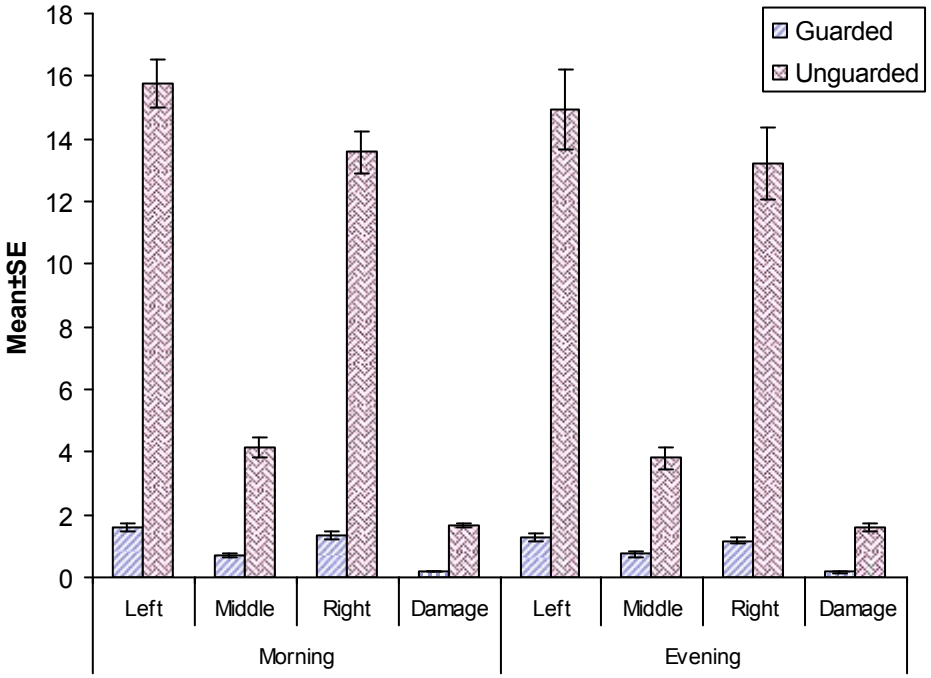


Fig. 4. Crow depredations recorded for the morning and evening house in the three corners of the maize field in the farmland.

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