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FEEDING PREFERENCE OF *Mylabris pustulata* (THUNBERG) TOWARDS DIFFERENT GRAIN LEGUMES UNDER LABORATORY CONDITIONS

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ABSTRACT

Blister beetle, *Mylabris pustulata* (Thunberg) is a major flower feeding pest of grain legumes. Experiment on feeding preference on flowers of different pulse crops under laboratory conditions revealed that *M. pustulata* preferred pigeonpea flowers followed by urdbean. Mungbean flowers were least preferred by *M. pustulata*. Among the different host plants, *M. pustulata* consumed 87.22 per cent flowers of pigeonpea, followed by 43.52 and 30.38 per cent in urdbean and mungbean. Among different varieties, pigeonpea var. AL 201, mungbean var. ML 818 and urdbean var. Mash 338 were relatively more preferred than other varieties of these pulse crops.

Keywords: Feeding preference, Mungbean, *Mylabris pustulata*, Pigeonpea, Urdbean

Mylabris pustulata (Thunberg) (Coleoptera: Meloidae), commonly known as blister beetle, is a major flower pest of many grain legumes which causes substantial yield losses in pulse crops like pigeonpea, mungbean and urdbean, thus ultimately affecting their grain yield. Blister beetle has emerged as a predominant insect pest of pigeonpea in Punjab (Taggar *et al.*, 2015). Insect feeding preference represents insect encounter with different host plant tissue types and host preference depends upon the presence of feeding inducing stimuli or the absence of feeding inhibiting stimuli in the host plant (Singh and Parihar, 1988).

The adult beetles were flower-feeders and polyphagous in nature and are reported to feed on selective host plants from different families (Durairaj and Ganapathy, 2003). The host plants included cucurbits, alfalfa, peanuts, soybean, ornamental flowers, potato, tomato, pulses, okra, tobacco, sugar beet, onion, spinach, pumpkin, mango, citrus fruits in various countries (Balachowsky, 1962; Beirne, 1971; App and Manglitz, 1972; Zethner and Laurense, 1972; Ward, 1985). Besides, adult beetles were reported to feed on a wide range of host plants within families, particularly Asteraceae, Leguminosae, Compositae, Umbliferae, Solanaceae, Fabaceae, Malvaceae, Convolvulaceae and Solanaceae (Arnett *et al*., 2002; Bologna and Pinto 2002; Lebesa *et al*., 2011). The beetle feeds on some selective host plant species which are drawn from a few families. The number and diversity of host plant species of *M. pustulata* is very wide (Durairaj and Ganapathy, 2003; Durairaj and Senguttuvan, 2003). Durairaj and Ganapathy (2003) reported more than 50 plant species as host plants for *M. pustulata* in crop ecosystems in South India. Authors further stated that most of the host plant species were from Malvaceae and Leguminaceae families suggesting that *M. pustulata* preferred plants from these two families over the other families.

Blister beetles cause considerable damage because of their gregarious nature and adversely affect the seed production (Nikbakhtzadeh, 2004). Studies on crop losses under field conditions showed that blister beetle caused up to 36.20 per cent damage to flowers and 53.22 per cent losses in yield in pigeonpea and 15.80 per cent damage to flowers and 35.90 per cent losses in yield in mungbean crop (Singh, 2012). The investigations on crop losses under net house conditions revealed that *M. pustulata* caused maximum reduction up to 54.18 per cent in pod setting, 20.15 per cent in seed setting and 65.00 per cent in grain yield in pigeonpea. However, in mungbean crop, *M. pustulata* caused maximum reduction up to 67.14 per cent in pod setting, 26.65 per cent seed setting and 75.29 per cent in grain yield (Singh ,2012). Mouth parts of blister beetle are well built and adapted for feeding on floral parts and even tender developing pods of plants (Raju *et al*., 2016). Host plant tissues, stems and leaves are generally not fed upon by blister beetle when flowers are present in the field. Since florivory has been documented, we hypothesized that flower tissue was a preferred tissue type for feeding.

Pigeonpea, urdbean and mungbean are the important grain legumes being cultivated in Punjab and over the years, *M. pustulata* is essentially causing losses not only to the flowers of these crops, but is also a constraint in their successful seed production. Food preference studies, when properly interpreted, can help to develop control strategies that are based on different degrees of plant susceptibility and/or nutritional

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quality for pest development and survival (Panizzi and Parra, 1991). It becomes imperative to have an adequate knowledge on its incidence and host plant preference for feeding behaviour for managing this pest properly. Therefore, the objective of this study was to determine the relative feeding preference of *M. pustulata* when given a choice of flowers belonging to different grain legumes under laboratory conditions so that a better assessment of losses in relation to the severity of this pest could be made.

MATERIALS AND METHODS

The experiment on feeding preference of *M. pustulata* on different pulse crops such as pigeonpea, urdbean and mungbean was conducted in Entomological Laboratory of Pulses Section, Department of Plant Breeding and Genetics, Punjab Agricultural University, Ludhiana. The recommended varieties of pigeonpea (PAU 881 and AL 201), mungbean (PAU 911 and ML 818) and urdbean (Mash 114 and Mash 338) were sown on an area of 600 sq m (100 sq m for each variety) at Research Farm of Pulses Section, Department of Plant Breeding and Genetics, Punjab Agricultural University, Ludhiana to get continuous supply of flowers. Feeding preference of *M. pustulata* towards the flowers of selected grain legume varieties was assessed using Multiple-choice technique (Plate 1). Ten flowers of each crop variety were plucked along with petiole and kept in respective Petri dishes containing a layer of 3 per cent Agar-agar medium for maintaining the freshness of flowers. Each of the Petri dishes was further placed in a plastic tub at an equal distance from centre. A set of five field collected adult beetles of *M. pustulata* was starved for 3 hours and released in the centre of each tub and the tub was immediately covered with muslin. Fresh flowers were provided to the beetles after every six hours thrice a day. Treatments were replicated thrice and repeated after every fortnight in the month of September and October. The observations on feeding preference in terms of the per cent flowers eaten or damaged by the beetles for each variety of pigeonpea, mungbean and urdbean were recorded after six hours of release of beetles and thereafter at six hours interval (Plate 2). The mean percentage of flowers eaten in all the test varieties was analyzed using factorial completely randomized design (CPCS1 software).

RESULTS AND DISCUSSION

The results of the feeding preference of *M. pustulata* revealed that throughout September and October, the pigeonpea flowers were most preferred for feeding by *M. pustulata* among the different pulse crops evaluated (Table 1). There were significant differences in the feeding preference of flowers of both the pigeonpea varieties (in terms of per cent flowers eaten) by the beetle as well as at different time intervals (6-18 h of feeding). Flowers of pigeonpea var. AL 201 were more preferred by *M. pustulata* (96.67% flowers eaten during II fortnight of September) as compared to var. PAU 881 (84.44%). During this month, the beetle consumed the maximum of 91.67 per cent flowers of pigeonpea after 12 hours of release. As far as the flower preference of mungbean was concerned, var. ML 818 was significantly more preferred (36.67% flowers damaged) by *M. pustulata* over var. PAU 911 (25.56%) during the first fortnight of September (Table 1). The percentage of flowers of mungbean eaten, was however, maximum (31.67%) after 6 and 12 hours of release during the II fortnight of September and I fortnight of October. Among the different months of feeding, the flowers of urdbean var. Mash 338 were more significantly preferred by the beetle (55.56% flowers eaten) during the I fortnight of September as compared to var. Mash 114 (40% flowers eaten). During this period, it was observed that the beetle consumed the maximum percentage of flowers (53.33%) after 6 hours of release.

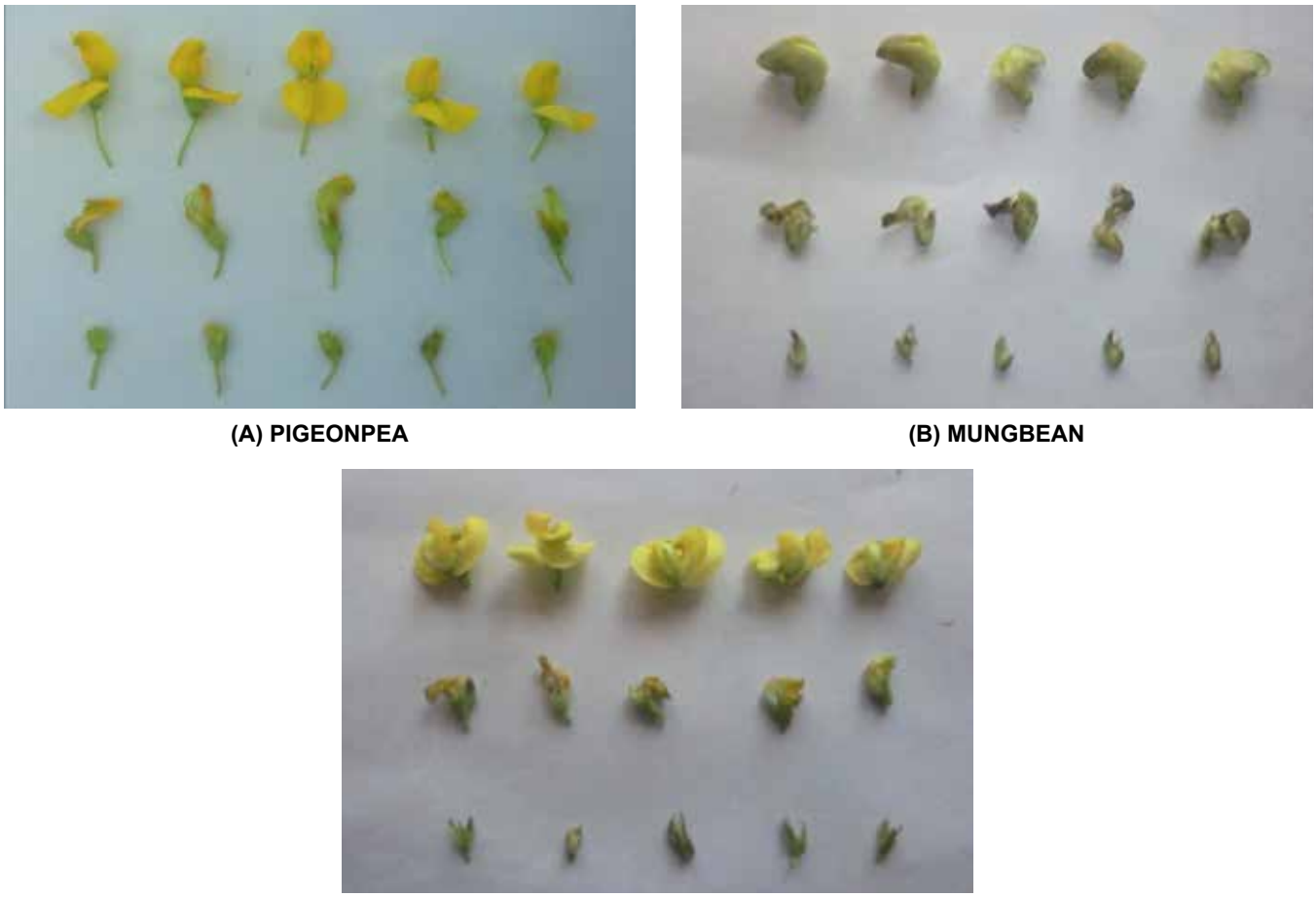
The pooled data on feeding preference studies over different feeding time intervals for the two months period revealed that pigeonpea was more preferred by *M. pustulata* among the other grain legumes evaluated

Plate 1. Multiple choice test for assessing the feeding preference of *M. pustulata* on pigeonpea, mungbean and urdbean

Table 1. Feeding preference of *M. pustulata* on pigeonpea, mungbean and urdbean under laboratory conditions

Month interval	Time interval	Per cent flowers eaten or damaged by *M. pustulata*								
		Pigeonpea variety			Mungbean variety			Urdbean variety		
		PAU 881	AL 201	Mean	PAU 911	ML 818	Mean	Mash 114	Mash 338	Mean
September (I fortnight)	After 6 hr	83.33 (66.12)	96.67 (83.82)	90.00 (74.97)	26.67 (30.98)	40.00 (39.13)	33.33 (35.06)	46.67 (43.06)	60.00 (50.75)	53.33 (46.90)
	After 12 hr	83.33 (66.12)	93.33 (77.68)	88.33 (71.90)	26.67 (30.98)	36.67 (37.21)	31.67 (34.10)	40.00 (39.13)	56.67 (48.83)	48.33 (43.98)
	After 18 hr	73.33 (59.68)	90.00 (74.97)	81.67 (76.33)	23.33 (28.77)	33.33 (35.20)	28.33 (31.99)	33.33 (34.91)	50.00 (44.98)	41.67 (39.95)
	Mean	79.99 (63.97)	93.33 (78.82)		25.56 (30.25)	36.67 (37.18)		40.00 (39.03)	55.56 (48.19)	
		C.D. (p = 0.05) (Time) = NS C.D. (p = 0.05) (Varieties) = 10.01 C.D. (p = 0.05) (Interaction) = NS			C.D. (p = 0.05) (Time) = NS C.D. (p = 0.05) (Varieties) = 4.26 C.D. (p = 0.05) (Interaction) = NS			C.D. (p = 0.05) (Time) = NS C.D. (p = 0.05) (Varieties) = 5.58 C.D. (p = 0.05) (Interaction) = NS		
September (II fortnight)	After 6 hr	83.33 (66.61)	96.67 (83.82)	90.00 (75.22)	26.67 (30.98)	33.33 (34.91)	30.00 (32.95)	36.67 (37.21)	50.00 (44.98)	43.34 (41.10)
	After 12 hr	86.67 (68.83)	96.67 (83.82)	91.67 (76.32)	26.67 (30.77)	36.67 (37.21)	31.67 (33.99)	33.33 (35.21)	46.67 (43.06)	40.00 (39.13)
	After 18 hr	83.33 (66.11)	96.67 (83.82)	90.00 (74.97)	23.33 (28.77)	30.00 (33.20)	26.67 (30.98)	33.33 (35.21)	46.67 (43.06)	40.00 (39.13)
	Mean	84.44 (67.19)	96.67 (83.82)		25.56 (30.18)	33.33 (35.11)		34.44 (35.87)	47.48 (43.70)	
		C.D. (p = 0.05) (Time) = NS C.D. (p = 0.05) (Varieties) = 8.96 C.D. (p = 0.05) (Interaction) = NS			C.D. (p = 0.05) (Time) = NS C.D. (p = 0.05) (Varieties) = 4.35 C.D. (p = 0.05) (Interaction) = NS			C.D. (p = 0.05) (Time) = NS C.D. (p = 0.05) (Varieties) = 4.02 C.D. (p = 0.05) (Interaction) = NS		
October	After 6 hr	80.00 (63.90)	96.67 (83.82)	88.34 (73.83)	26.67 (30.98)	36.67 (37.21)	31.67 (34.10)	40.00 (39.22)	46.67 (43.06)	43.34 (41.14)
	After 12 hr	76.67 (61.69)	93.33 (77.68)	85.00 (69.68)	26.67 (30.98)	36.67 (37.21)	31.67 (34.10)	36.67 (37.13)	50.00 (44.98)	43.34 (41.05)
	After 18 hr	73.33 (58.98)	86.67 (68.83)	80.00 (63.90)	23.33 (28.77)	33.33 (35.20)	28.33 (31.99)	30.00 (32.99)	46.67 (43.06)	38.34 (38.02)
	Mean	76.67 (61.52)	92.22 (76.78)		25.56 (30.25)	35.56 (36.54)		35.56 (36.44)	47.78 (43.70)	
		C.D. (p = 0.05) (Time) = NS C.D. (p = 0.05) (Varieties) = 8.29 C.D. (p = 0.05) (Interaction) = NS			C.D. (p = 0.05) (Time) = NS C.D. (p = 0.05) (Varieties) = 3.76 C.D. (p = 0.05) (Interaction) = NS			C.D. (p = 0.05) (Time) = NS C.D. (p = 0.05) (Varieties) = 5.55 C.D. (p = 0.05) (Interaction) = NS		

Figures in parentheses are angular transformations



(A) PIGEONPEA (B) MUNGBEAN

(C) URDBEAN

Plate 2. Flower damage By *M. pustulata* on different pulse crops

Table 2. Extent of flower damage by *M. pustulata* in pigeonpea, mungbean and urdbean under laboratory conditions

Crop	Variety	*Per cent flowers eaten or damaged by *M. pustulata*	Mean
Pigeonpea	PAU 881	80.37 (63.70)	87.22
	AL 201	94.07 (76.08)	
Mungbean	PAU 911	25.56 (30.35)	30.38
	ML 818	35.19 (36.36)	
Urdbean	Mash 114	36.67 (37.23)	43.52
	Mash 338	50.37 (45.19)	
C.D. (p = 0.05)		(3.41)	

Figures in parentheses are angular transformations
*Average of three observations taken in September and October months

under laboratory conditions (Table 2). The results suggested that 80.37 per cent flowers of pigeonpea var. PAU 881 were consumed by the beetle as compared to 94.07 per cent flowers of var. AL 201 during different months of crop season. In case of mungbean, the flowers of var. PAU 911 were less consumed by the beetle (25.56%) as compared to those of var. ML 818 (35.19%) during different months. In case of urdbean, the flowers of var. Mash 114 were less preferred (36.67%), while those of var. Mash 338 were more preferred (50.37%) by *M. pustulata* during the different months of crop season. The results also indicated that the mean number of flowers eaten in pigeonpea crop were relatively higher (87.22%) followed by urdbean (43.52%) and mungbean (30.38%).

The trends in the feeding preference of the flowers

of different grain legumes in the present study are in accordance with the results of Durairaj (2000) who reported 47.93, 26.67 and 17.53 per cent flower damage in pigeonpea, urdbean and mungbean, respectively under laboratory conditions. Dhakla *et al.* (2010) also reported that flower damage in different genotypes of pigeonpea varied significantly and ranged from 16.6 to 27.5 per cent under laboratory conditions. The variation in the per cent damage may, however, be attributed to the differences in genetic background of the varieties as well as in agro-climatic conditions. The present studies clearly indicated that the adult beetles of *M. pustulata* exhibited the highest preference for pigeonpea flowers and the lowest preference for mungbean flowers, under the multiple-choice condition. The results of the present studies are in conformity with the findings of Durairaj and Ganapathy (1996) who also observed that pigeonpea was the most preferred host crop of blister beetle followed by cowpea, black gram, and green gram. Besides, Yadava *et al.* (1988) also concluded that among the major pulse crops, pigeonpea is the highly preferred host followed by cowpea, urdbean and mungbean by the blister beetle.

It can, therefore, be inferred from the findings of the present study that amongst different pulse crops, pigeonpea flowers are the most preferred by the blister beetle. The findings of this study can be utilized by targeting the adult blister beetles in the flowering phase of their most favoured crop phenology (pigeonpea) in order to ensure the cost effectiveness of the management treatments.

Authors' contribution

Conceptualization of research work and designing of experiments (GS, RS, GKT); Execution of field/lab experiments and data collection (GS, RS); Analysis of data and interpretation (GS, RS); Preparation of manuscript (GKT, GS, RS)

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