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Evaluation of Resistance in Local Five Pakistani Chickpea Varieties against Callosobruchus Spps

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Abstract
During this research morphological data was recorded 1st before starting labe. Work. In free choice test, the response of both species of *Callosobruchus* on candidate variety for oviposition was different. The adult emergence of both species of *Callosobruchus* on candidate varieties shows no significant difference. Both species of *Callosobruchus* in free choice test have no significant difference for percent adult's emergence on candidate varieties. Percent damage of both species of *Callosobruchus* on candidate varieties was different.
Keywords: Chickpea, *Cicer arietinum* L, Phytic acid, legumes, beetle, weevil

INTRODUCTION

Chickpea, *Cicer arietinum* L; is the second largest grown food legume of the world (Gaur et al*.,* 2008). It is one of the most important crops of the world due to their nutritional quality. Chickpea contain also certained anti-nutrional constituents such as trypsin inhibitors, Phytic acid and tannins (Wang et al., 2010).). Pulse seeds suffer great damage during storage due to insect attack. Pulses are invariably infested with beetle and weevil in field and storage time (Adugena, 2006). The *C. chinensis* is a major pest of stored legumes in warm temperate and tropical climates. It has a capability to infest not only cultivated host plants in the field and stored legumes but also a few legumes (Fahd et al., 2011). It is cosmopolitan in distribution found in the countries where tropical and subtropical conditions prevail (Riaz et al*.,* 1994). Occasionally 100% of stored seeds are damaged with up to 60% weight losses (Golnaz et al., 2011).

Schalk et al. (1973) tested the seeds of 49 lines of chickpea in the laboratory for susceptibility to oviposition by *C. maculatus* and concluded that resistance is affected by the roughness of the seed coat. Katiyar and Khare (1985) studied 20 germplasm of gram in the laboratory for their relative susceptibility to pulse beetle *C.chinensis* (L). Hamed et al. (1988**)** evaluated the susceptibility of eleven local pulses against *C. maculatus.* Srivastava and Pant (1989) studied the development and growth of *C. maculates* on various pulse seeds in the laboratory.

Ahmed et al. (1989) evaluted eighteen chickpea genotypes for their susceptibility to *C. maculatus* taking into account the number of undamaged seeds, number of emergence holes per 50 seeds. Resistance to the bruchids appeared to a more heritable trait than the other two damage characters. The number of emergence holes was a better indicator of seed resistance than the number of eggs present on the seeds.

Fatemeh et al. (2011) concluded that *C. maculatus* (Coleoptera: Bruchidae) is the most damaging pest of legume seeds in the tropics and subtropics. Biology and growth population were investigated on chickpea ,variety Jam, cowpea, lentil and green gram. The results showed that net reproductive rates (*R)* were 12.85±1.53 on chickpea, 15.37±0.72 on cowpea, 11.57±2.71 on lentil and 14.74±2.29 on green gram. Intrinsic rates of increase on above legumes were 0.0795±0.004, 0.0919±0.001, 0.0683±0.006 and 0.0791±0.004, respectively. The generation time (G*)* was the longest on lentil (36.28±0.01 day) and the shortest on the cowpea (29.77±0.07 day). The shortest doubling time (DT) was obtained on cowpea (7.55±0.12 days).

Materials and Methods

The culture of *C. chinensis* and *C. maculates* was maintained on a mungbean variety at 27±2 and 60±5% r.h with12:12 hr light: dark cycle for a number of generations in the laboratory. Grains containing single egg were isolated from the stock culture and a single grain with a single egg will be placed in glass vial and plugged with cotton to get individual virgin adults in captivity. After the emergence of adults from these eggs adults were identified as male and female on the basis of body size, shape, and color. Five pairs of newly emerged adults were collected within 24 hours and released in glass jars (5x 10 cm) having 50 gram of each of five varieties. The insects were allowed to remain there for the purpose of egg lying till they died. The new adults emerged and continued their next generation. Data on number of eggs oviposited, total number of adults emerged and % adult emerged were recorded.

In free choice test, complete choice was given to pulse beetle to oviposit on five chickpea varieties (KK1, KC 98, Lawaghar, and KK2, Sheenghar). For this purpose blue and white box measuring 2.5 x 2.5 x 35

cm was divided into 25 equal sections measuring 1 x 6.25 x 7 cm and in each section 5 grains of each chickpea varieties were placed randomly in each choice section. 20 pairs of newly emerged adults of *C. chinensis* and *C. maculates* were released in each choice chamber and box was covered with muslin cloth. The experiment was replicated five times. Data of the following parameters was recorded i.e. no of eggs oviposited on each treatment, no of holes (number of adults emerged) % adult emergence and percent damage.

Results and Discussion

Before the start of experimentation process, number of grains/50 gram of candidate varieties was counted. The KK_1 and KK_2 were small in small in size, wrinkled in shape a dark in color had 261 and 226 number of grains/50 gram. The Kc98 and Sheenghar were medium in size, round in shape a hard in texture had 181 and 206 number of grains/50 gram. Variety Lawaghar large in size, round and light in color had 178 grains/ 50 gm.

In free choice test, the response of both species of *Callosobruchus* on candidate variety for oviposition was different. The oviposition by specie *C. chinensis* had no significant difference on candidate varieties. However maximum number of eggs were oviposited on variety Sheenghar (47) followed by KK2 (46), KC-98 (45), KK1 (41) and Lawaghar (39). However the ovipostion response of the species *C. maculates* was significantly different on candidate varieties. The data revealed that variety Lawaghar received significantly less number of eggs (18) while variety Sheenghar received significantly high number of eggs (27) than rest of the candidate varieties. Average number of eggs deposited on other candidate verities were KK_2 (23), KK_1 (22) and KC-98 (21). In other words variety "Lawaghar" performed better in test for the preference of oviposition by *Callosobruchus* spp.

The adult emergences of both species of Callosobruchus on candidate varieties show no significant difference. However high number of adult emergence of *C. chinensis* is recorded on variety K_{C-98} and Lawaghar (6) followed by Sheenghar (4), KK_2 (4) and KK_1 (3). Similarly maximum number of *C. maculatus* adults emerged from variety KK_2 and K_{C-98} (3) followed by Sheenghar and Lawaghar (2) and KK_1 (2). Both species of *Callosobruchus* in free choice test have no significant difference for percent adult's emergence on candidate varieties . However the data revealed that high number of percent adult emergence was recorded on Lawaghar as (13) by *C. chinensis* and *C. maculatus* respectively whereas K_{C98} appeared to be second most preferred variety with (13) and (14) percent adult emergence of *C. chinensis* and *C. maculatus* respectively. KK_1 and Sheenghar varieties were moderately preferred for percent adult emergence as (8) and (10) of *C. chinensis* and (13) and (8) respectively. Variety KK_2 was least preferred as significantly lower percent adult emergence of *C. chinensis* (8) and *C. macultus* (13) were observed on this variety. Percent damage of both species of *Callosobruchus* on candidate varieties was different. The data revealed that the percent damage by *C. chinensis* on candidate varieties is significantly different while no significant percent damage by *C. macultus.* Variety KK_1 received significantly minimum percent damage (52) than rest of the candidate varieties by *C. chinensis*, while variety K_{C-98} received significantly maximum percent damage(84). Other varieties received moderate percent damage by *C. chinensis* KK_2 (60), Lawaghar (72) and Sheenghar (80). Percent damage by *C. maculates* on candidate varieties has no significant difference, however variety Lawaghar and Sheenghar received minimum percent damage (26) followed by KK_1 (33) and K_{C-98} (40).

DISCUSSION

The results presented in the previous chapter revealed that the response of chickpea varieties varied against *C. chinensis* and *C. maculates*. The present studies were undertaken on five chickpea varieties, i.e., $KK_{1, KC98}$, KK_2, Lawaghar and Sheenghar against *Callosobruchus spp* under controlled laboratory conditions. All these varieties were different in grain size, hence their response varied significantly against *Callosobruchus spp* infestation. The response of observed grains pests to stored grain commodities depends upon multiple factors. The important ones are variety, insect pest species and grain size (Khattak et al., 1987). Within a variety there could be variations like texture, smooth or rough surface and chemical constituents of the grains (Khattak et al., 1987). The experiment was carried out in one set, i.e., free choice test. The results of the results of Khattak et al. (1991) revealed that the highest numbers of eggs (572) per female were observed on variety 6153 while the lowest numbers of eggs (36) were observed on CM-72. The findings of present research were not in close conformity with the findings of Khattak et al. (1991) because environmental condition might be different, and the experimental design might be different. But the insect species which was used in present research and Khattak et al. (1991) research was same but the chickpea varieties which were used in both researches were different. However the results of Ashfaque et al. (2001) revealed that the variety Noor-91 had high protein content was more susceptible. However the results of Ashfaque et al. (2001) support a present research due to experimental condition and experimental design might be same and the insect species was same but chickpea varieties were different.

Conclusion

In the light of the above findings, it was found that local varieties Lawaghar and Sheenghar tend to be more resistant than non-local varieties KK_1 and K_{C-98}. But the local varieties were low in protein content while non-local varieties had high protein contents comparatively. Although control of the pest during storage was possible using methods such as chemicals, irradiation. The results of this present research showed that the variety Lawaghar was a promising one which could be incorporated in further breeding programme as bruchid resistant chickpea and it was free from damage by the *Callosobruchus spp*.

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