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Research Article

The effect of physical mutation on the life history parameters and ovipositional preference of the *Plutella xylostella*

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Abstract: Reproductive parameters and ovipositional preference of *Plutella xylostella* were assessed on some mutant genotypes of canola (RGS 8-1, RGS 10-2, RGS 8-13, Zar 9-9 and Talaye 8-3) and their cultivars (RGS, Zar, Talaye) under greenhouse condition (21 ± 6 °C, 65 ± 10 RH and a photoperiod of 16L: 8D h). Comparison of the reproductive parameters on RGS and its mutant genotypes revealed that mutant genotype RGS 8-1 was the most susceptible genotype to the pest, having maximum values of gross reproductive rate (182.7 female eggs/ female), net fecundity rate (248.2 eggs/ female) and mean number of fertile eggs (8.98 fertile eggs/female/day). The last parameter was the lowest on RGS 8-13 (3.05 fertile eggs/ female/day). In no-choice condition, the experiment of ovipositional preference indicated no significant difference among mean number of deposited eggs on the three cultivars compared with their mutant genotypes after 24 h. While, in choice test, mutant genotype, RGS 10-2 (151.67 eggs) was preferred over RGS and the two other mutant genotypes. This study revealed that effect of physical mutation on resistance of canola to *P. xylostella* may vary depending on canola cultivar and different mutant genotypes of the same cultivar. This point should be considered by plant breeders when releasing these mutant plants with appropriate cultural traits for utilizing by farmers.

Keywords: Mutant canola, *Plutella xylostella*, Reproductive parameters, Ovipositional preference.

Introduction

Plutella xylostella L. (Lep.: Plutellidae) is a worldwide serious pest of Brasicaceous crops including cabbages and canola. Because of its high fecundity, short generation time and resistance to insecticides, utilizing alternative tactics such as host plant resistance and biocontrol agents would be more effective to successfully control this herbivore (Sarfraz and Keddie, 2005; Soufbaf *et al*. 2010).

Canola, *Brassica napus* L., is an economically important oilseed crop with the production of about 7 milliard tons in the world and 35 million tons in Iran (FAO, 2013). Mutation breeding by gamma irradiation as a physical mutation agent is one of the main techniques to improve many crops that have been used by plant breeders to improve specific traits in cultivars (Ahloowalia and Maluszynski, 2001). As a result of induced mutations, improved varieties with better genotypic and phenotypic characters have been suggested to farmers (Kumar and Srivastava, 2013). Producing plant varieties through this technique (Gamma radiation) causes random, multiple genetic modifications in plants (Novak and

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Brunner, 1992). These changes can be within the gene, losses or additions of genes or groups of genes and probably changes in the relations of genes to each other (Ahloowalia and Maluszynski, 2001). Moreover, interaction of gamma rays with atoms or molecules of plants may produce free radicals in their cells; thereby cellular structure of plants (such as trichomes) and their metabolism are impacted depending on the irradiation level (Dhanavel *et al*., 2012). Effects of such modifications on plant quality and higher trophic levels such as herbivores and their natural enemies, are unknown. Host plant resistance is one of the most important strategies of integrated pest management programs that can reduce the initial infestations by many pests of Brassicaceae (Ahuja *et al.*, 2010). This strategy can act as an essential tool for *P. xylostella* management with reduced input of insecticides. Plant resistance to a pest can be caused by antixenosis, antibiosis, tolerance, or some combinations of these mechanisms (Smith *et al*., 1994). In present study, to shed light on the effects of these mutant plants on fitness of the herbivore, we studied reproductive parameters (to evaluate antibiotic resistance) and ovipositional preference of *P. xylostella* (to evaluate antixenosis resistance). Furthermore, leaf area consumed by *P. xylostella* on mutant genotypes and their cultivars was estimated and the role of leaf trichome density in ovipositional preference (antixenosis) was also evaluated. Our findings can be used for developing an efficient integrated management program for the pest.

Materials and Methods

Plant and insect rearing

Seeds of 8 canola including mutant genotypes (Zar 9-9, RGS 8-1, RGS 10-2, RGS 8-13 and Talaye 8-3) and their cultivars (Zar, RGS and Talaye) were obtained from Nuclear Science and Technology Research Institute (NSTRI), Karaj, Iran. Gamma irradiation of canola seeds was carried out at above institute. Physical mutation was aimed at induction of high yield and early maturity in experimental genotypes. The seeds were planted in a 1:1:1 mix of peat moss: perlite: soil in plastic pots (20 cm height and 30 cm diameter). All plants were irrigated two times a week and five-week-old plants were used in the experiments. The population of herbivore, *P. xylostella* were initially collected from the cabbage fields located in Karaj (35° 48' N, 51° 00' E), Iran, and reared on *Brassica juncea* (L.) (Brasssicaceae) for two generations. All plants and insects were maintained under greenhouse conditions (21 ± 6 °C, 65 ± 10 RH and a photoperiod of 16L: 8D h).

Reproductive parameters

Plutella xylostella eggs (< 24 h) reared on respective host plants were placed on upper surface of the leaves individually using a soft brush. Each leaf containing an egg was confined using a clip cage (9 × 7 × 2.5 cm). On each canola genotype, fifty to eighty clip cages units were established. These cages were checked daily until the adults emerged. Adults reared on each host plant were coupled in ventilated cylindrical containers (10 cm diameter and 9 cm height), containing a leaf from the respective canola genotype with daily replacement. Each container was equipped with cotton soaked in sugar solution (10%). Survival rate and female fecundity were recorded until all females died. The experiment was replicated 15 times. Reproductive parameters were estimated using Carey (1993) formula.

Gross reproductive rate (GRR) = $\sum_{x=\alpha}^{\beta} m_x$

Gross fecundity rate = $\sum_{x=\alpha}^{\beta} M_x$

Gross fertility rate = $\sum_{x=\alpha}^{\beta} h_x M_x$

Net fecundity rate = $\sum_{x=\alpha}^{\beta} L_x M_x$

Net fertility rate = $\sum_{x=\alpha}^{\beta} L_x h_x M_x$

Daily eggs per female = $\frac{\sum_{x=\alpha}^{\beta} L_x M_x}{\sum_{x=\varepsilon}^{\omega} L_x}$

$$\text{Daily fertile eggs per female} = \frac{\sum_{x=\alpha}^{\beta} L_x M_x h_x}{\sum_{x=\varepsilon}^{\omega} L_x}$$

where, α is the first day of oviposition period; β is the age of female at the last oviposition; m_x denotes the average number of female eggs laid by each female during x to x + 1 age interval; M_x indicates the mean number of total eggs laid by each female during x to x + 1 age interval; L_x is the days lived in interval x and x+1; h_x represents the hatch rate; ω is the maximum age of female; ε is the age of female at the first day of adult period.

Ovipositional preference

The ovipositional preference of *P. xylostella* was evaluated by counting the eggs laid on each canola genotype. We tested the mutant genotypes against their cultivar separately. A 10% sugar solution was provided for moths feeding. The experiment was repeated three times. The numbers of deposited eggs were recorded after 24 h. The insects reared on *B. juncea* were used in current experiment. For choice experiment, the pots of cultivar and the respective mutant canola (each pot contained one plant) were placed in a ventilated cage (80×80×60 cm) and two pairs of newly emerged adult per plant were released in each cage. The no-choice experiment was conducted similarly, except that newly emerged adults were released in the separate ventilated lidded pots.

Trichome density

For each test canola four leaf discs (1 cm^2) were taken from different middle leaves of different plants. Trichome densities on abaxial and adaxial leaf surfaces were estimated under a stereomicroscope (Leica EZ4D, Singapore).

Leaf area consumption

To quantify the effect of mutant plants on feeding of a *P. xylostella* larvae, 40 early-fourth instar larvae starved for 24 h were reared on *B. juncea*. Then, five of them were placed on middle leaves of each test canola separately and confined by a ventilated lidded cage (9 cm in length, 7 cm in width and 2.5 cm in height). After 24 h, eaten areas by the herbivore were measured using Image J software version 1.47.

Statistical analysis

Data on three cultivars and their mutant genotypes were subjected to one-way ANOVA (Proc. GLM, SAS Institute 2003) and the differences among means were estimated utilizing Student-Newman-Keuls (SNK) at 5% level. Then, each cultivar with their mutants was compared separately to find out the effect of physical mutation in different cultivars. The pseudo-values of the reproductive parameters on cultivar RGS and its mutant genotypes were subjected to one-way ANOVA (Proc. GLM, SAS Institute 2003) and the differences among means were estimated utilizing Student-Newman-Keuls (SNK) at 5% level. The same values on cultivars Zar and Talaye in comparison with their respective mutant genotypes were compared using Student's t-test (Minitab Inc. 2007) at $\alpha = 0.05$. The eggs of *P. xylostella* laid on cultivar RGS and its mutant genotypes, leaf areas fed by the herbivore and trichome densities of these hosts were compared using Student-Newman-Keuls (SNK) at 5% level after one-way ANOVA. The same values on cultivars Zar and Talaye in comparison with their respective mutant genotypes were compared using Student's t-test (Minitab Inc. 2007) at α=0.05. To find out relationship between oviposition preference and trichome density, correlation was conducted using Pearson product-moment coefficient with a significance level of $\alpha = 0.05$.

Results

There were significant differences among all tested genotypes in terms of gross fecundity rate ($F = 4.09$; df = 7, 129; $P < 0.0005$), gross reproductive rate ($F = 325.84$; df = 7, 129; $P < 0.0001$), gross fertility rate ($F = 430.79$; df

= 7, 129; $P < 0.0001$), net fertility rate (F = 419.75; df = 7, 129; $P < 0.001$), net fecundity rate (F = 112.21; df = 7, 129; $P < 0.0001$), mean number of eggs (F = 56.73; df = 7, 129; $P < 0.0001$) and fertile eggs (F = 299.33; df = 7, 129; $P < 0.0001$) per female per day. However, there was no significant difference among all tested genotypes in terms of consumed leaf area (F = 0.43; df = 7, 39; P = 0.87) and trichome density (F = 1.70; df = 7, 31; P = 0.157) (Table 1).

Reproductive parameters

All reproductive parameters including gross fecundity rate (F = 4.09; df = 7, 129; $P < 0.0005$), gross reproductive rate (F = 325.84; df = 7, 129; $P < 0.0001$), gross fertility rate (F= 430.79; df= 7, 129; $P < 0.0001$), net fertility rate (F = 419.75; df = 7, 129; $P < 0.001$), net fecundity rate (F = 112.21; df = 7, 129; $P < 0.0001$) showed significant differences on all cultivars in comparison with their mutant genotypes. A significant difference was observed in the gross reproductive rate (GRR) of *P. xylostella* on cultivar RGS in comparison with its mutant genotypes (F = 534.99; df = 3, 69; $P < 0.001$). The highest GRR was attained on RGS 8-1, while the three other genotypes did not differ significantly. There was no significant difference among cultivar RGS and its mutant genotypes in terms of gross fecundity rate (F = 2.04; df = 3, 69; P = 0.11). The highest gross fertility rate was on RGS 8-1 and the lowest was on RGS 10-2 (F = 650.45; df = 3, 69; $P < 0.001$). Also, there was a significant difference in net fertility rate (F = 645.07; df = 3, 69; $P < 0.001$) and net fecundity rate (F = 197.3; df = 3, 69; $P < 0.001$) on RGS in comparison with its mutant genotypes. The highest and the lowest value of these parameters were obtained on RGS 8-1 and RGS 8-13, respectively (Table 2). Gross fecundity rate and net fecundity rate of *P. xylostella* on cultivar Zar were higher than those of its mutant genotype (Table 3). Conversely, both gross fecundity and fertility rate values of the herbivore were higher on the mutant genotype (Talaye 8-3) than its cultivar (Table 4).

The mean number of eggs and fertile eggs per female per day on canola cultivars and their mutant genotypes are shown in Fig. 1. The mean number of eggs on Zar was higher than its mutant genotype (T = 2.23; df = 22; P = 0.036). While, the mean number of fertile eggs per female per day on the two cultivars Talaye and Zar did not differ in comparison with their mutant genotypes. There was a significant difference among the mean number of eggs per female per day on RGS and its mutant genotypes (F = 99.71; df = 3, 69; $P < 0.0001$). The cohort reared on mutant genotype (RGS 8-1) had the highest mean fertile eggs per day and those on RGS 8-13 had the lowest mean fertile eggs (F = 139.39; df = 3, 69; $P < 0.0001$).

Ovipositional preference and trichome density

Deposited eggs on different genotypes didn't differ significantly in no-choice tests but in choice test significant differences were observed (F = 7.87; df = 7, 23; $P < 0.001$). Cultivars (Talaye and Zar) in comparison with their mutant genotypes did not differ in terms of the number of deposited eggs in both choice and no-choice tests. The same result was obtained on RGS as opposed to its mutant genotypes in no-choice test, but RGS 10-2 showed the greatest number of eggs (151.67 ± 12.02) as opposed to its cultivar and the two other mutant genotypes in choice test (F = 9.41; df = 3, 11; $P < 0.01$). Trichome density differed significantly on abaxial (F = 4.24; df = 3, 15; P = 0.029) leaf surfaces among RGS and its mutant genotypes. Number of trichomes in mutant genotypes of RGS was lower than their cultivar. RGS had the most trichomes while, the mutant genotype, RGS 8-1 lacked trichomes (Fig. 2). There was no significant correlation between the number of trichomes and ovipositional preference of *P. xylostella* on any of the tested genotypes.

Table 1 All measured parameters (mean ± SE) of *Plutella xylostella* on canola genotypes under greenhouse condition.

Parameters	RGS (cultivar)	RGS 8-1 (mutant line)	RGS 10-2 (mutant line)	RGS 8-13 (mutant line)	Talaye (Cultivar)	Talaye 8-3 (mutant line)	Zar (Cultivar)	Zar 9-9 (mutant line)
Gross reproductive rate	152.8 ± 14.2^{b}	182.7 ± 14.3^{a}	128.7 ± 11.0^{b}	138.5 ± 8.5^{b}	112.1 ± 10^{b}	118.6 ± 15^{b}	151.0 ± 16^{b}	135.8 ± 8.5^{b}
Gross fecundity rate	359.8 ± 29.1^{a}	357.3 ± 28.9^{a}	277.0 ± 24.5^{ab}	307.0 ± 18.2^{ab}	221.1 ± 18^{b}	333.0 ± 35^{a}	349.0 ± 31^{a}	252.9 ± 17^{ab}
Gross fertility rate	219.6 ± 14.1^{b}	257.2 ± 20.8^{a}	188.3 ± 16.6^{c}	248.6 ± 14.7^{a}	154.8 ± 13^{d}	232.8 ± 24^{ab}	181.6 ± 16^{cd}	161.9 ± 11^{cd}
Net fertility rate	45.53 ± 6.5^{d}	178.7 ± 4.7^{a}	75.5 ± 4.3^{c}	56.0 ± 2.4^{d}	53.5 ± 4.4^{d}	57.1 ± 3.4^{d}	92.2 ± 4.6^{b}	96.6 ± 3^{b}
Net fecundity rate	70.04 ± 2.5^{e}	248.2 ± 6.5^{a}	111.1 ± 6.4^{d}	69.2 ± 2.9^{e}	76.4 ± 6.2^{e}	81.6 ± 4.8^{e}	177.2 ± 8.8^{b}	150.9 ± 4.7^{c}
Egg (female/day)	7.55 ± 0.24^{b}	11.61 ± 0.42^{a}	5.96 ± 0.38^{c}	3.77 ± 0.17^{e}	4.40 ± 0.39^{de}	5.11 ± 0.33^{cd}	8.72 ± 0.50^{b}	7.48 ± 0.25^{b}
Fertile egg (female/day)	4.43 ± 0.11^{b}	8.98 ± 0.30^{a}	4.05 ± 0.26^{bc}	3.05 ± 0.14^{d}	3.08 ± 0.27^{d}	3.57 ± 0.23^{cd}	4.54 ± 0.26^{b}	4.79 ± 0.16^{b}
Consumed leaf area	20.18 ± 3.12^{a}	18.21 ± 4.56^{a}	19.08 ± 2.93^{a}	14.15 ± 2.51^{a}	18.71 ± 3.06^{a}	16.96 ± 3.77^{a}	18.07 ± 1.23^{a}	20.79 ± 2.81^{a}
Trichome density	2.50 ± 0.64^{a}	0.00 ± 0.00^{a}	0.75 ± 0.48^{a}	1.25 ± 0.63^{a}	3.00 ± 1.73^{a}	1.00 ± 0.58^{a}	0.50 ± 0.50^{a}	1.00 ± 0.41^{a}

The means followed by same letters in each row are not significantly different at the $P = 0.05$ level (SNK).

Table 2 The reproductive parameters (mean ± SE) of *Plutella xylostella* on cultivar RGS and its mutant genotypes under greenhouse condition.

Reproductive parameters	RGS (Cultivar)	RGS8-1 (Mutant)	RGS 10-2 (Mutant)	RGS 8-13 (Mutant)
Gross reproductive rate	152.8 ± 14.2^{b}	182.7 ± 14.3^{a}	128.7 ± 11.0^{b}	138.5 ± 8.5^{b}
Gross fecundity rate	359.8 ± 29.1^{a}	357.3 ± 28.9^{a}	277.0 ± 24.5^{a}	307.0 ± 18.2^{a}
Gross fertility rate	219.6 ± 14.1^{b}	257.2 ± 20.8^{a}	188.3 ± 16.6^{c}	248.6 ± 14.7^{a}
Net fertility rate	45.53 ± 6.5^{d}	178.7 ± 4.7^{a}	75.5 ± 4.3^{b}	56.0 ± 2.4^{c}
Net fecundity rate	70.04 ± 2.5^{c}	248.2 ± 6.5^{a}	111.1 ± 6.4^{b}	69.2 ± 2.9^{c}

The means followed by same letters in each row are not significantly different at the $P = 0.05$ level (SNK).

Table 3 The reproductive parameters (mean ±SE) of *Plutella xylostella* on cultivar Zar and its mutant genotype under greenhouse condition.

Reproductive parameters	Zar (Cultivar)	Zar 9-9 (mutant)	df	*T*
Gross reproductive rate	151.0 ± 16^{a}	135.8 ± 8.5^{a}	23	-0.83$^{n.s}$
Gross fecundity rate	349.0 ± 31^{a}	252.9 ± 17^{b}	23	-2.72*
Gross fertility rate	181.6 ± 16^{a}	161.9 ± 11^{a}	26	-1.02$^{n.s}$
Net fertility rate	92.2 ± 4.6^{a}	96.6 ± 3.0^{a}	26	0.80$^{n.s}$
Net fecundity rate	177.2 ± 8.8^{a}	150.9 ± 4.7^{b}	23	-2.64*

The means followed by same letters in each row are not significantly different at the $P = 0.05$ level (*t*-student test).

Table 4 The reproductive parameters (mean ± SE) of *Plutella xylostella* on cultivar Talaye and its mutant genotype under greenhouse condition.

Reproductive parameters	Talaye (Cultivar)	Talaye 8-3 (Mutant)	df	*T*
Gross reproductive rate	112.1 ± 10[a]	118.6 ± 15[a]	17	0.36 [n.s]
Gross fecundity rate	221.1 ± 18[b]	333.0 ± 35[a]	13	2.84[*]
Gross fertility rate	154.8 ± 13[b]	232.8 ± 24[a]	13	2.84[*]
Net fertility rate	53.5 ± 4.4[a]	57.1 ± 3.4[a]	22	0.65 [n.s]
Net fecundity rate	76.4 ± 6.2[a]	81.6 ± 4.8[a]	22	0.65 [n.s]

The means followed by same letters in each row are not significantly different at the $P = 0.05$ level (*t*-student test).

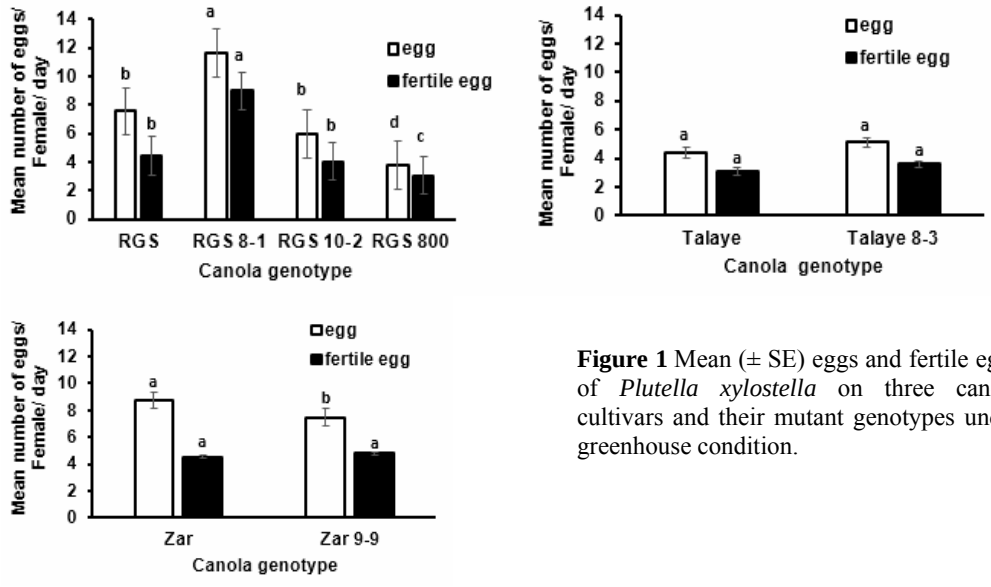

Figure 1 Mean (± SE) eggs and fertile eggs of *Plutella xylostella* on three canola cultivars and their mutant genotypes under greenhouse condition.

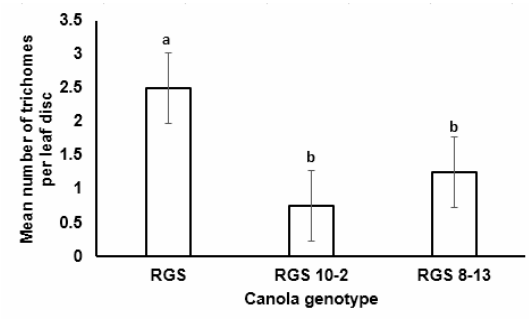

Figure 2 Trichome density on abaxial surface of leaf discs of RGS and its mutant genotypes. Means and standard errors are presented. The mutant genotype, RGS 8-1 is not shown as it lacked trichomes.

Leaf area consumption

There was no significant difference between tested genotypes in terms of leaf area consumption ($F = 0.43$; df = 7, 39; $P = 0.875$). Also, leaf areas fed by early-fourth instar larvae of *P. xylostella* did not differ significantly on RGS ($F = 0.61$; df = 3, 19; $P = 0.618$), Talaye ($T = 0.36$; df = 7; $P = 0.370$) and Zar ($T = -0.89$; df = 5; $P = 0.415$) in comparison with their mutant genotypes.

Discussion

Quality of host plant during pre-adult stages of insect pests can affect fecundity and fertility in adult stage, obviously thereby host plant resistance is affected as well (Awmack and Leather, 2002; Goodarzi *et al*., 2015). Utilizing partially resistant plants is one of the key strategies for controlling pests in integrated management (IPM) programs (Smith *et al*., 1994). Assessing the reproductive parameters of a pest is necessary item in designing an integrated pest management strategy (Naseri *et al*., 2011). Reproductive parameters values on RGS obtained in this study were less than those attained by Soufbaf *et al*. (2013) on this cultivar. These dissimilarities may be explained by differences in environmental factors (Golizadeh *et al*. 2009; Awmack and Leather, 2002). The present study showed that the mutant genotype, RGS 8-1 was more susceptible to *P. xylostella* than its cultivar and other mutant genotypes. The mean number of fertile eggs obtained on mutant genotype, RGS 8-13 (3.05 fertile eggs/ female/ day) showed that this genotype is more resistant than the RGS and other mutant genotypes. These results are similar to our previous study on population parameters of this pest on these hosts i.e. the maximum and minimum values of intrinsic rate of increase of the pest were obtained on mutant genotypes, RGS 8-1 and RGS 8-13, respectively (Unpublished data). Thus, RGS 8-1 was more susceptible to *P. xylostella* than its cultivar and other mutant genotypes. Nonetheless, the pest preferred to oviposit on mutant genotype, RGS 10-2. Altering the phytochemicals by gamma irradiation might change suitability of host plant to *P. xylostella* (Kovacs and Keresztes, 2002). However, Ahloowalia and Maluszynski (2001) suggested that factors such as species or genotypes of plants and irradiation dose can influence mutagenesis process. The present study showed that the mutant genotype RGS 10-2 was preferred over its control cultivar and the two other mutant genotypes under choice test. Talaye and Zar in comparison with their mutant genotypes did not differ significantly in terms of deposited eggs of *P. xylostella* in this condition (Choice test). It has been exhibited that *P. xylostella* is attracted to various cruciferous host plants by chemical (olfactory/gustatory) and physical (tactile/visual) stimuli (Justus and Mitchell, 1996; Badenes-Perez *et al*., 2004). Differences in attractiveness of surfaces could be clarified by visual, chemical, and tactile differences between substrates (Justus *et al*., 2000). Moreover, Host plant acceptance is mediated by a balance of sensory inputs from both positive and negative stimuli produced from potential host plants (Dethier, 1982; Ebrahimi *et al*., 2008). Therefore, it has been postulated that physical mutation caused some alterations in mutant genotype, RGS 10-2 in terms of different oviposition stimuli. It is reported that host plant abundance, prior experience, presence of conspecifics, genetic and environmental factors also can affect ovipositional preference of *P. xylostella* (Ebrahimi *et al*., 2008). However, in the present study correlation between oviposition and overall trichome density was not significant. This result is similar to the experience of Sarfraz *et al*. (2007) but is in contrast to some previous studies done by Talekar *et al*. (1994) and Handley *et al*. (2005). This inconsistency might be related to other factors which cause variation in plant morphology and influence the ovipositional preference of *P. xylostella*.

In manipulated plants, the levels of primary and secondary metabolites often change (Gols *et al*., 2008). Hence, it is assumed that this anthropogenic force impacts the fitness of the associated insects. Nikooei *et al*. (2015) investigated the effect of different genetically manipulated *Brassica* genotypes (Mutant, hybrid and transgenic genotypes) on life table parameters of *P. xylostella*. Accordingly, they indicated that these manipulated genotypes were more resistant to the development and reproduction of *P. xylostella* than the canola cultivars and the progenitor. The present study focused on the effect of some mutant genotypes of canola in comparison with their cultivars in terms of *P. xylostella* reproductive parameters and

ovipositional preference and revealed that the effect of mutation on resistance of canola may vary depending on canola cultivar and different mutant genotypes of one cultivar. Further Phytochemical studies for understanding how these compounds differ through gamma irradiation and subsequently affect plant-arthropod interactions are recommended. In addition, field experiments and longer periods of behavioral observations are needed to confirm these results. The information can be utilized for designing a comprehensive IPM program for controlling *P. xylostella* effectually only then plantation of mutant canola would be prioritized by farmers.

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تأثیر موتاسیون فیزیکی بر پارامترهای زیستی و ترجیح تخم‌گذاری بید کلم *Plutella xylostella*

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چکیده: پارامترهای تولیدمثلی و ترجیح تخم‌گذاری بید کلم *Plutella xylostella* (Lep.: Plutellidae) روی تعدادی از ژنوتیپ‌های موتانت کلزا (RGS 8-1, RGS 10-2, RGS 8-13, Zar 9-9 and Talaye 8-3) و کولتیوارهای شاهد آن‌ها (RGS, Zar, Talaye) در شرایط گلخانه (دمای ۶ ± ۲۱ درجه سلسیوس، رطوبت نسبی ۱۰ ± ۶۵ درصد و دوره‌ی نوری ۱۶ ساعت روشنایی و ۸ ساعت تاریکی) مورد بررسی قرار گرفت. محاسبه‌ی پارامترهای تولیدمثلی *P. xylostella* روی کولتیوار RGS و ژنوتیپ‌های موتانت آن نشان داد ژنوتیپ موتانت RGS 8-1 به‌دلیل بیش‌ترین مقادیر نرخ تولید مثل ناخالص (۱۸۲/۷ تخم/ ماده)، نرخ خالص باروری (۲۴۸/۲ تخم/ ماده) و میانگین تخم‌های بارور(۸/۹۸ تخم بارور/ماده/روز) حساس‌ترین ژنوتیپ نسبت به این آفت می‌باشد. کم‌ترین میزان پارامتر اخیر (۳/۰۵ تخم بارور/ماده/روز) روی ژنوتیپ موتانت RGS 8-13 حاصل شد. آزمایش ترجیح تخم‌گذاری در شرایط عدم انتخاب بعد از ۲۴ ساعت اختلاف معنی‌داری بین میانگین تخم‌های گذاشته شده توسط آفت روی سه کولتیوار تحت بررسی در مقایسه با ژنوتیپ‌های موتانت آن‌ها نشان نداد. درحالی‌که در آزمایش انتخاب، ژنوتیپ موتانت RGS 10-2 (۱۵۱/۶۷ تخم) برای تخم‌ریزی توسط آفت نسبت به دو ژنوتیپ موتانت دیگر و کولتیوار شاهد ترجیح داده شد. این بررسی نشان داد که تأثیر موتاسیون فیزیکی کلزا بر مقاومت آن نسبت به آفت بید کلم بسته به کولتیوار کلزا و ژنوتیپ‌های موتانت آن متفاوت است. این نکته باید توسط متخصصین اصلاح نباتات هنگام معرفی گیاهان موتانت با ویژگی‌های مناسب زراعی به‌منظور استفاده کشاورزان مورد توجه قرار گیرد.

واژگان کلیدی: کلزای موتانت، بید کلم، پارامترهای تولید مثلی، ترجیح تخم‌گذاری