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Resistance evaluation in jassids against Imidacloprid on Egg Plant under laboratory conditions

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Abstract
Eggplant is one of the important food plant and is consumed on daily basis around the World. Eggplant is attacked by several insects which affects the growth of egg plants. Insects have developed the resistance against insecticides which are usually sprayed on them. Jassids attack more on egg plants and are difficult to control with normally sprayed insecticides. Experiment was conducted to observe the resistance development in jassids against imidacloprid which is sprayed against this pest. In this experiment recommended and lower concentrations were used to observe the resistance development, if any, in jassids. Experiment was conducted in petri dishes, adults and nymphs were tested separately in two tests. In experiment leaf was sprayed with insecticide in comparison to control petri dishes. One petri dish was having one adult and one nymph in each tests. Ten petri dishes for each experiment were observed for each treatment. Results showed that mortality was higher in recommended concentration test as compared to control for both adults and nymphs of jassids. While mortality was low at lower concentration in both tests of nymphs and adults as compared to control. These experiments explicitly reveal that mortality of jassids was in conjugation to concentration. As conclusion it can be asserted that resistance is not developed in jassids against imidacloprid. Instead more research is needed in future to observe its biochemical pathways in jassids.

Keywords: Resistance, imidacloprid, jassids, efficacy

1. Introduction

Eggplant or Brinjal (*Solanum melongena)* belonging to solanaceous family is a essential crops found in sub-tropical and tropical areas. The major producing countries are Pakistan, China, Phillipines, Bangladesh, India, France and Italy. Over the world, 1853000 ha area gave 48424295 tonnes of crop in 2012. (FAO 2014/ Sujayanand *et al*. 2015) [14] Within our country Pakistan, the land under brinjal/eggplant cultivation is about 9,044 ha and the product obtained from this area is approximately 97,466 kg/ha. Having nutritious values, it is major mode of providing minerals, antioxidants, vitamins, proteins and fibres (Yousafi *et al*. 2013) [15]. It is helpful in remedy of heart diseases by minimizing the cholesterol level in the blood. Consuming 100 grams of eggplant provides 2, 229, 6, 3 milli grams of Na, K, carbohydrates and fibres respectively (Kumar *et al*. 2014) [8].

Many insect pests attack on this valuable cropincluding brinjal fruit and shoot borer (*Leucinodes orbonalis*), huda beetle (*Henosepilachna vigintiopunctata*) and sap sucking insects like jassid *(Amrasca bigutulla*), whitefly (*Bemisia tabbaci*) thrips (*Thrips palmi*) and many others. From all of the above mentioned insects jassids are the major pest of eggplant. Both nymphs and adults feed and cause damage to the plant. They suck the cell sap and cause leaf to turn yellow and curl which ultimately lead to the death of the plant cell. Heavy infestation includes symptoms of burning leaf blades which results into fall of fruit. (Ali *et al*. 2012.) [3]

Controlling these insect by the use of chemical method is the effective one. Different insecticides are sought to be efficient against sucking insect i.e. new chemistry insecticides, IGRs, pyrethroids and bio-pesticides etc. Various insecticides such as imidacloprid, endosulfan, profenophos and azadirichtin (bio-pesticide) are applied to seek the results against jassid and other sucking insects. Studies prove that imidacloprid is the most effective and efficient with 79% results followed by the endosulfan and profenophos with 67% and 65% outcomes (Akbar *et al*. 2015) [2].

Chemical control is considered as a rapid remedy because it has a significant effect on the population of pest. Non-judicious and aimless use of insecticide lead to the worst effects on man's life and alarming for non-targeted insects (Akbar *et al*. 2015.) [2] Spraying chemicals may cause the residual toxicity in fruit (Patel *et al*. 2015.) [9]. The sufficient use of insecticides results in development of insecticide resistance in successive generations of insects. This also cause the death of farmer friend insects and their inadequate use is hazardous to ecosystem. (Al-Mamun *et al*., 2014) [4].

Materials and Methods

Experimental Design

Experiment was conducted at Post graduate lab Department of Entomology University of Agriculture Faisalabad during

March- April 2017 on eggplant.

Insect Collection and Rearing

The adults and neonates were collected randomly from the field and reared on eggplant leaves in graduated beakers under lab conditions. Humidity was maintained by placing a humidifier. Feed was changed after every two days. 3rd instar immature and adults were selected for treatment. Temperature (26°C) and Relative Humidity 60±5%.

Treatment

Treatment was carried out by making two concentrations of Imidacloprid i.e. recommended and low against Amrasca bigitulla

We take 30 petri-dishes and place one jassid in one petri-dish. Among these petri-dishes 20 were left untreated for control in such a way that 10 for adults and 10 for immature and 10 were treated at 0.1% imidacloprid. Similarly we make 2nd standard concentration 0.2% and treat the leaves and release insects on moisturized leaves. Data was taken after different time intervals i-e 2 hours, 4 hours, 8 hours interval. The effectiveness of both insecticide concentrations was estimated by counting the number of dead and alive insects after each interval.

Results

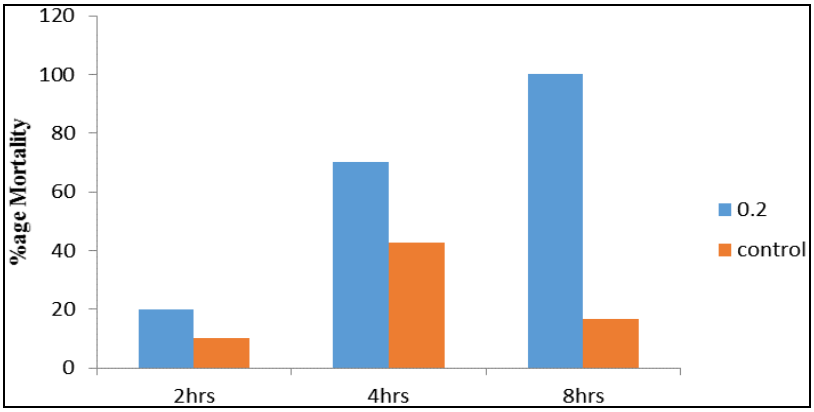

Fig 1: Time Interval

Above fig 1 shows that when imidacloprid @ 0.2% was applied 100% mortality of jassid was observed after 8 hours followed by 4 hours and 2 hours which was 70 % and 20 % respectively. While in control treatment maximum mortality was after 4 hours which was 42%.

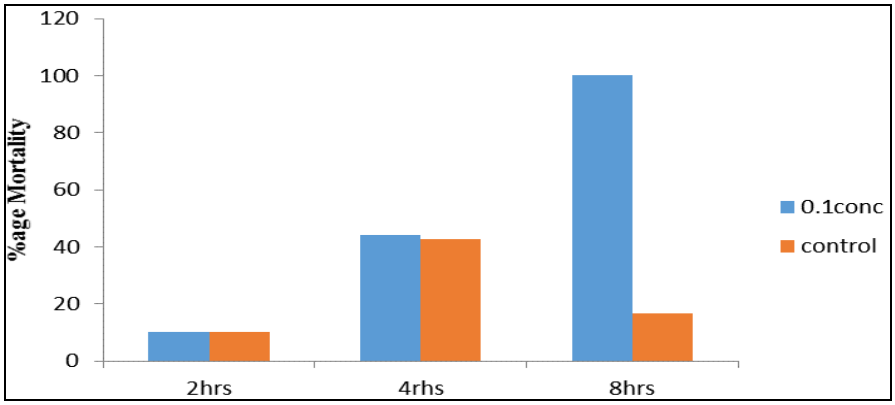

Fig 2: Time Interval

Above fig 2 shows that when imidacloprid @ 0.1% was applied 100% mortality of jassid was observed after 8 hours followed by 4 hours and 2 hours which was 44 % and 10 % respectively. While in control treatment maximum mortality was after 4 hours which was 42%.

Table 1: Percentage mortality of jassid after different time intervals

	Time interval		
Concentration	**After 2 hours mortality**	**After 4 hours mortality**	**After 8 hours Mortality**
Recommended 0.2%	20%	70%	100%
Low 0.1%	10	44%	100%

Discussion

A laboratory study was conducted to check the efficacy of different concentration of insecticide (imidacloprid) against Jassid (*Amrasca devastans*) in brijal crop. Jassid (*Amrasca devastans*) is considered as second most destructive pest of Brinjal crop after the Brinjal fruit borer. Experiment was conducted to find out the best concentration of the new chemistry insecticides for the proper control of Jassid (*Amrasca devastans*). Our study results were as higher concentration of insecticide other than recommended dose was more effective against the jassid (*Amrasca devastans*). On lower concentration, there was less mortality of jassid (*Amrasca devastans*) observed. Considerable control of jassid was observed on recommended dose of the imidaclprid but not as much as on higher concentration.

Imidacloprid in the control of jassid has been found effective over other insecticides tried along with, in a number of experiments (Solangi and Lohar, 2007) [12]. Our results were in conformity to the above results as imidacloprid was more effective for the control of jassid on higher concentrations. Our results were in agreement to the (Aheer *et al.* 2000) [1] who reported that imidcloprid was very highly effective against the jassid (*Amrasca bigutulla*) in cotton crop. Our results were in similarity to the above as in control against jassid but only the difference was exist is the crop that conducted on brinjal.

Best control of jassid was observed when imidacloprid applied to the Cotton crop to maintain the sustainability in control (Aslam *et al*. 2004) [5]. In our findings, higher concentrations were most effective in comparison to lower concentrations against the jassid (*Amrasca devastans*) that was in agreement to the above study.

Our findings were in similarity to the (Raghuraman and Gupta, 2006) [10] that exposed in a study acetamaprid and imidacloprid were found to most effective against cotton jassid.

Efficacy of different neem extracts against the *Amrasca devastans* were tested for the effective control of brinjal jassid. Results shows that this was more effective (Srisivasan *et al.* 2000) [13] our findings were in similarity to the above study as imidacloprid was more effective against the brinjal jassid. Our results were in similarity to the (Misra *et al.*, 2003) [6, 7] who reported that imidacloprid was the most effective against okra jassid (*Amrasca biguttula biguttula*) with significant dominance among different pesticides.

Performance of imidacloprid different doses was checked against chilli thrips as a root and seed treatment and found a very effective against the thrips. Our findings were in a much similarity to the above study as different concentrations of imidacloprid were checked and higher doses were most effective in terms of mortality. We should use the best concentration for the effective control of that destructive pest of Brinjal crop.

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