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## Assessment of solomon 300 OD (beta-cyfluthrin 9% + imidacloprid 21%) against wheat aphid, *Schizaphis graminum* (Rondani)

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### Abstract

A field experiment was conducted during 2017-18 at Pantnagar (India) to evaluate the bio-efficacy of Solomon 300 OD (beta-cyfluthrin 9% + imidacloprid 21%) against wheat aphid in comparison to beta-cyfluthrin 25 SC, imidacloprid 200 SL, quinalphos 25 EC and thiamethoxam 25 WG. The treatment of Solomon 300 OD @ 400 ml/ha was found to be the most superior in reducing aphid population with higher grain yield of wheat. At this concentration, it did not show any symptom of phytotoxicity on wheat.

**Keywords:** *Schizaphis graminum*, insecticides, solomon 300 OD, bio-efficacy, wheat, pesticide mixture

### 1. Introduction

Wheat is the second important food crop in India next to the rice with an area, production and productivity of 30.23 MH, 93.50 MT and 30.93 q/ha, respectively [1]. In India, its productivity is lower as compared to the world [2]. Among the various constraints of low productivity, attack of insect pests is one of the major problems. From sowing to harvesting, more than a dozen of insect pests attack on the wheat crop. Among different threats to wheat production, wheat aphid, *Schizaphis graminum* R. stands as prominent insect pest. In the recent past, wheat aphid has gained a status of the regular pest. Aphid has been found affecting wheat production adversely causing 35-40% direct and 20-80% indirect yield losses by transmission of viral and fungal diseases. Aphids are small soft bodied insects and often called plant lice. They cause damage to many host plants directly by sucking the cell sap from leaves, spikes and stems. indirectly they transmitted disease and excreting honeydew on which development of sooty mould interfere photosynthesis [3]. Heavy infestation of aphid depends upon favourable climatic conditions. Wheat which was an insecticide's application free crop but there is an increasing trend of insecticide's use due to the pest problems. Although the application of insecticides is associated with negative impacts on human health, environment and prolonged persistence of chemicals in nature. But, at severe attack, the chemical control is the only choice to deal with the sap-sucking insects like aphids. Therefore, the present investigation was undertaken to evaluate different insecticides against wheat aphid, *S. graminum* R.

### 2. Materials and Methods

A field experiment was laid out in randomized block design (RBD) to study the efficacy of Solomon 300 OD (beta-cyfluthrin 9% + imidacloprid 21%) with three doses of 200, 300 and 400 ml/ ha against wheat aphid, *S. graminum* R. on wheat crop during Rabi season, 2017-18 at Norman E. Borlaug Crop Research Centre (NEBCRC) of G. B. Pant University of Agriculture and Technology, Pantnagar (India). betacyfluthrin 25 SC (1450 ml/ ha), imidacloprid 200 SL (405 ml/ ha), quinalphos 25 EC (1000 ml/ ha), thiamethoxam 25 WG (50 g/ha) were used for comparison along with untreated control and replicated thrice. The crop variety UP 2785 was sown on 11<sup>th</sup> October with plot size of 5 m x 5 m and distance between row to row and plant to plant was 22.5cm and 5cm, respectively. The recommended agronomic practices were followed. Foliar spray of different treatments was made in 375 litres of water/ha. Data on the aphid population were recorded from 10 randomly selected plants in each plot one day prior and 3, 7 and 14 days after insecticide application. The yield in each treatment was recorded and expressed in q/ha.

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## 2.1. Statistical analysis

The data were subjected to the analysis of variance using STPR 3 software.

## 3. Results

The population of *S. graminum* on wheat in various treatments was recorded one day before and 3<sup>rd</sup>, 7<sup>th</sup> and 14<sup>th</sup> day after insecticide application during the crop season 2017-18. before spray, the mean population of *S. graminum* ranged from 500.43 to 590.33 aphids per plant (Table 1). Subsequent to spray, aphid population was significantly decreased in all the treated plots, while significantly increased in untreated plots. On the basis of overall mean of aphid population after

spray, all the treatments were found significantly better than untreated control. Among the treatments, Solomon 300 OD applied at the rate of 400ml/ha was found to be superior with minimum aphid population (30.97 aphid/plant) while least effective treatment was quinalphos 25 EC with higher aphid population (108.14 aphid/plant).

The data on yield (q/ha) (Table 1) indicated that under different insecticidal treatments, it varied significantly from 30.92 to 45.32 q/h. Maximum seed yield (45.32 q/h) was recorded from plots treated with Solomon 300 OD applied at the rate of 400 ml/ha while the lowest seed yield (38.44 q/h) was recorded with quinalphos 25 EC.

**Table 1:** Bio-efficacy of insecticides against wheat aphid, *Schizaphis graminum* (Rondani)

Treatments	Dose (ml or g /ha)	Aphid population (per plant)					Yield (q/ha)
		PTC	After Spray				
			3DAS	7DAS	14DAS	Mean	
Solomon 300 OD (Beta-cyfluthrin 9% + Imidacloprid 21%)	200	510.33 (22.60)*	116.0 (10.79)	38.66 (6.26)	8.23 (2.95)	54.29 (6.67)	43.84
Solomon 300 OD (Beta-cyfluthrin 9% + Imidacloprid 21%)	300	533.54 (23.11)	86.0 (9.30)	28.67 (5.40)	5.17 (2.38)	39.95 (5.69)	45.04
Solomon 300 OD (Beta-cyfluthrin 9% + Imidacloprid 21%)	400	579.65 (24.09)	67.66 (8.26)	20.43 (4.57)	4.81 (2.30)	30.97 (5.04)	45.32
beta-cyfluthrin 25 SC	1450	500.43 (22.38)	150.0 (12.27)	48.34 (6.99)	11.08 (3.40)	69.80 (7.55)	38.92
imidacloprid 200 SL	405	556.12 (23.59)	123.66 (11.14)	41.22 (6.46)	9.30 (3.13)	58.06 (6.91)	42.40
quinalphos 25 EC	1000	532.34 (23.08)	253.0 (15.92)	54.33 (7.40)	17.08 (4.19)	108.14 (9.17)	38.44
thiamethoxam 25 WG	50	511.78 (22.63)	132.33 (11.53)	44.78 (6.73)	10.2 (3.27)	62.44 (7.17)	40.92
Untreated control	-	590.33 (24.31)	623.34 (24.98)	700.56 (26.48)	753.32 (27.46)	692.41 (26.30)	30.92
CD ( $P = 0.05$ )	-	55.17 (7.46)	302.86 (17.42)	389.06 (19.74)	437.40 (20.93)	376.44 (19.36)	7.87
Sem	-	11.73 (3.50)	64.39 (8.06)	82.72 (9.12)	93.0 (9.67)	80.03 (8.95)	1.67

PTC = pre treatment count DAS = days after spray \*Data presented in parentheses are square root transformed values  $\sqrt{N+0.5}$

## 4. Discussion

Pesticide mixture is the combination of two or more pesticides into a single spray solution. Mixing of two or more pesticides enhances the toxicity of mixture due to synergism or potentiation. They are broad spectrum, used against pest complex in the crop. Pesticide mixtures are more effective against arthropod pests than sole applications. Application of pesticide mixture results into the reduction in the number of applications due to long lasting residual effect that ultimately reduces labour costs [4]. Mixing insecticides with different activities, for instance contact with the systemic action may help in the control of different stages of the same pest. It may also be exploited to control different pests present on the crop at different stages [5]. They are particularly used for resistance management.

Usually, systemic insecticides are effective for the control of sucking insect pests. Several studies have been proposed the effectiveness of insecticide mixtures (including at least one systemic insecticide) in suppressing the populations of aphids [6, 7]. Solomon 300 OD is a combination product of beta-cyfluthrin and imidacloprid and possesses contact and systemic properties. Beta-cyfluthrin is a synthetic pyrethroid, which acts on the insects' nervous system as sodium channel blocker leading to excitation followed by knockdown and death. Imidacloprid is antagonist to the nicotinic acetyl choline receptor in the central nervous system leading to excitation of nerve cell and death. The effectiveness of

Solomon 300 OD has been demonstrated against several insect pests and mites on different crops [8-10]. It has also reported that Solomon (Beta-cyfluthrin 9% + Imidacloprid 21%) 300 OD @ 15.75 + 36.75 and 18 + 42 g. a.i. /ha was the most superior treatments for the control of aphids on brinjal with higher fruit yield [11].

## 5. Conclusion

Solomon 300 OD, a mixture of beta-cyfluthrin 9% and imidacloprid 21%, is more effective than individual compounds as well as cost effective, possesses certain advantages over sole application of insecticides. It is better to use this formulation in the wheat ecosystem to manage aphids without any hazard of phytotoxicity.

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