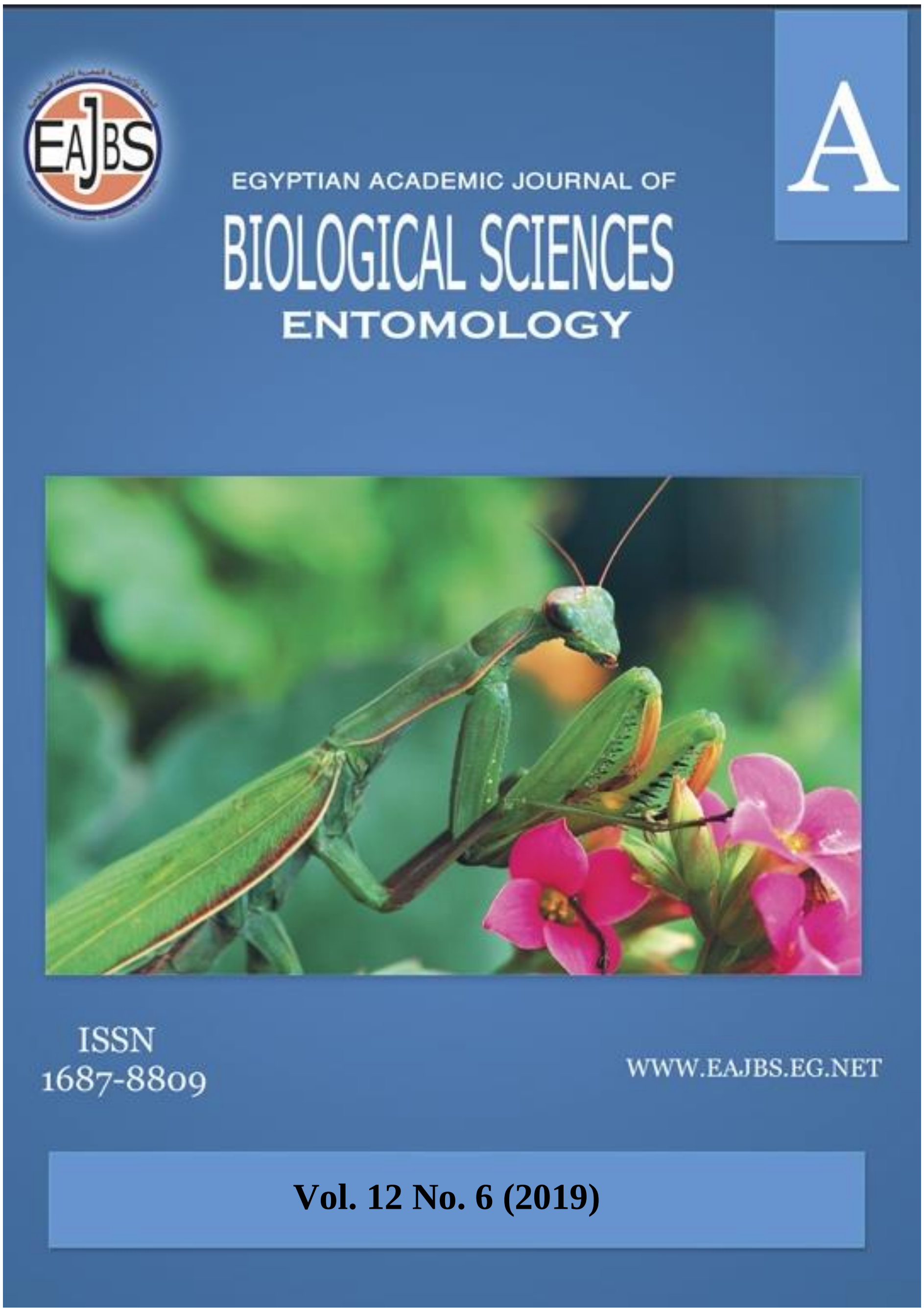

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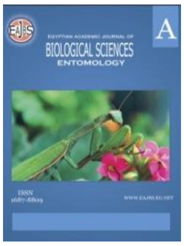

Comparative Efficacy of Imidacloprid as Seed Treatment Insecticide against Sucking Insects and their Predators in the Wheat Crop

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ABSTRACT

Sucking insects are the most serious insect pests in wheat crops; the harmful effect of aphid in wheat plants is due to sucking of plant sap, honeydew excretion and causing many diseases by transport of plant viruses. The experiment was carried out at Sakha Agric. Res. Station farm during 2017-2018 on wheat Giza 171 growing season. The insecticide used is Imidacloprid (Nofedor 600 FS.) The present study was designed to evaluate comparative efficacy of imidacloprid as seed dressing formulation against sucking insects (*Schizaphis graminum*, *Nezara viridula*, *Empoasca spp.*) as well as their predators; *Chrysoperla carena*, *Labidura riparia*, *Scymunus spp*. and true spiders in two types of wheat sowing (Drill and Broadcast) in the wheat crop field. The results according to analysis of variance showed that there was a significant variation among the insect's reduction in all-season periods as a result of treatment of the wheat seeds before sowing with imidacloprid in the Broadcast and drill sowing. Whereas there is no significant effect of the treatment when comparing *S. graminum* in different sowing methods, also there was a non-significant effect of the treatment on *S. graminum* in broadcast method versus *N. viridula*, *Empoasca spp*. and predators. While, the number of seeds/spikes, Weight of 100 seeds (gm) and the Germination increasing % in Broadcast sowing were more than that in Drill sowing by 1.31,1.11 and 1.11 respectively. Thus, it could be concluded that the broadcast sowing is suitable economically for farmers than drill sowing methods when using imidacloprid as seed dressing before cultivation for sucking insect control as well as its predators.

INTRODUCTION

Cereal wheat plant (*Triticum aestivum* L.) is one of the most important and main crops for most of the human population, In-country like Egypt, wheat is the first important food crop. Wheat production is heavily affected by numerous sucking pests. Moreover, the wheat field is highly attacked by many sucking insects since sowing till harvesting (Joshi and

Sharma 2009). Aphid is the most important pest among nine different species of wheat aphids reported to infest wheat crops in wheat-growing regions of India Joshi and Sharma (2009). The harmful effect of aphid in wheat plants is due to sucking of plant sap, honeydew excretion and causing many diseases by transport of plant virus Toper Kaygın *et al.*, (2008). Chemical insecticides could be the first choice against Hemipteran pests especially in case of outbreak. Shehawy *et al*., (2013).

On the other hand, Imidacloprid is one of the novel neonicotinoid insecticides and it is very active against sucking insects. That's why some studies were carried out by Li Cui *et al*. (2010) to evaluate the toxic activity of Imidacloprid against Aphid. Also, the sublethal concentration of Imidacloprid resulting in decreasing in the Aphid feeding behaviour, fecundity as well as growth rate. Also, Pike *et al.* (1993) reported that using Imidacloprid as seed treatment leads to significant reduction in plant damage by sucking insects. Moreover, the application of imidacloprid as seed dressing in wheat fields reduced sucking insects; *Schizaphis graminum* (Homoptera: Aphididae), as well as BYD occurrence, resulted in economic return Royer (2005). Using imidacloprid as seed treatment before cultivation gives good results in aphids control in growing season as well as it has less hazardous to the environment Ahmed *et al.* (2001). Furthermore, the greenbug which called *S. graminum* (Hemiptera: Aphididae) considered as one of the economic pests of *Triticum aestivum* L., this pest may inject the toxins, transmit the viral infections which responsible for plant death Costa et al., (2011). Also, Peng *et al.,* (2018) reported that the wheat seeds treated with clothianidin and imidacloprid were highly effective against wheat aphids and sucking insects under field conditions throughout the wheat growing season due to yield loss reduction.

The natural enemies; coccinellid beetle (Coccinella septempunctata) help to reduce aphid from reaching the economic injury level, (Pell and Vandenberg, 2002; Iqbal *et al.,* 2008). However, protection and conservation of the agricultural ecosystem are mostly narrow due to extensive use of chemical insecticides. Moreover, coccinellid beetles are exposed to insecticides directly or indirectly. Thus, careful selection of the chemical insecticide and its concentration can help to maintain sucking insects' predators, (Oakley *et al.,* 1996; Head *et al.,* 2000; Suhail *et al.* 2013*)*. However, the required effect of chemical insecticide on the target pests along with its impact on the natural enemies should be taken into consideration in pest management.

The present study was designed to evaluate the comparative efficacy of imidacloprid as seed dressing against sucking insects (*Schizaphis graminum*, *Nezara viridula*, *Empoasca spp.*) as well as its predators; *Chrysoperla carena, Labidura riparia, Scymunus spp*. and true spiders in two types of wheat sowing (Drill and Broadcast) in the field. Also, the effect of the treatment on number of grain/spikes, weight of 100 seeds and germination%.

MATERIALS AND METHODS

The experiment was carried out at Sakha Agric. Res. Station farm during 2017-2018 on wheat Giza 171 growing season. The insecticide used is Nofedor 600 FS. (Imidacloprid). The insecticide was used at a rate of 2.4 ml* Kg^{-1} of wheat seed. The treated and untreated control were cultivated on 19^{th} November 2017. The treated and untreated seeds cultivated with two types of cultivation; dry planting (Afeer) and tillage planting (Heraty). Each treatment in addition to untreated one was replicated four times 6*7 meters in complete randomized block design. All normal agricultural practices were followed without any foliar chemical spray during the growing season. To determine the population density of *Schizaphis graminum* (all stages), the green stink bug *Nezara viridula*

L. (adults) and the leafhoppers *Empoasca spp.* (Nymph & adults), in addition to the associated predators, 10 tillers were chosen randomly every week from every plot, in order to count the insects mentioned before as well as the predators (*Chrysoperla carena* , *Labidura riparia, Scymunus spp.* and true spiders). The infestation began from the 3rd week after sowing and continued until the 19th week. The general reduction percentages in the population throughout the counting period were calculated according to Abbots formula (1925). At the end of season, number of grains/spike were counted and weight of 100 seeds was recorded for every replicate.

Germination:

Three replicates of 25 seeds which were selected randomly from each treatment and placed on moist cotton pad in petri- dishes under laboratory conditions at 27±1C^{o} and 70±3%RH.

Statistical Analysis:

Reduction percentages were performed according to Abbott (1925). As well as analysis of variance (ANOVA) of the obtained data was performed by SPSS software and Duncan (1955).

RESULTS

Effect of Treatment Grains of Wheat with Imidacloprid on Insect Pest Population Reduction:

The data illustrated in Table (1) and Figures 1&2 showed the effect of imidacloprid on the population density of sucking insects including *Schizaphis graminum* (all stages), the green stink bug *Nezara viridula L.*(adults) and the leafhoppers *Empoasca spp.* (Nymph & adults), in addition to the associated predators; *Chrysoperla carena, Labidura riparia, Scymunus spp*. and true spiders in two types of sowing; Broadcast (dry sowing) (Afeer) and tillage Drill sowing (Heraty).

In the early season it was found that the reduction percentage in aphid ranged between (25.6% - 66.6%), while in the *N. viridula* L. the reduction percentages ranged between (33.3- 50%). On the other hand, the reduction percentages ranged between *E. spp.* (11.7 – 75), while the predators were absent in the tillage sowing (Heraty). Furthermore, in the case of broadcast sowing, the reduction percentages of *S. graminum* in the early season were (75, 66.6, 21.1, 16.6 and 41.1). Whereas, the reduction percentages in *N. viridula* were (0,0, 50,50 and 50). Moreover, the reduction percentages ranged between *E. spp.* were (60, 42.8, 15.3, 30.2 and 26.6), additionally, the predators were absent in the 1st, 2nd and 3rd week then appears in the 4th and 5th week in which the reduction percentages were (66.6 and 66.6) respectively. The average of insects namely; *Schizaphis graminum*, *Nezara viridula*, *Empoasca spp.* and predators were 42.65, 20.68, 24.03 and 13.34 respectively.

According to the data depleted in table (2), the standard error was (2.59). Thus, there was a highly significant difference between averages of *S. graminum* which recorded (42.65) while it was (20.68) in *N. viridula*. The difference between there averages was 21.97, this value was very high than Duncan value which was (2.59)*(2.83)=7.97 at (Duncan; 2,52; α 0.05). On the other hand, there was no significant difference between *N. viridula* and *Empoasca spp.* (Duncan; 2,52; α 0.05). Moreover, there was a significant difference between *Empoasca spp.* and predators (Duncan; 2, 52 and α 0.05). Furthermore, observation of insect's population in different season periods under wheat grain treatment with imidacloprid in the field were objected to analysis of variance, the data showed that there was highly significant difference between season periods as well as between insects at (α 0.01); (Tables 2&3).

Comparison between Insects in Different Periods; Early, Mid and Late-Season in Drill Sowing:

In order to compare insects in different periods of the same season; early season, mid- and late-seasons in drill sowing. The results showed that in Early season according to Duncan method, the average of insects namely; *S. graminum*, N. viridula, *Empoasca spp.* were 46.4, 16.6 and 35.8 respectively. SE= 4.36 thus Duncan value (2, 6 at α 0.05) = 3.46 *4.36 =15.08 between tow insects (*S. graminum*, *N. viridula*). While the difference between the two averages of them =29.8. (Table 2).

Comparison between insects in Different Periods; Early, Mid And Late-Season in Broadcast Sowing:

When comparing between different season periods (early, mid and late-season) according to analysis of variance it was found that there was high significant variation at α 0.01 between (early-season versus mid-season) and (early-season versus late-season) in insect reduction after treatment with imidacloprid in broadcast sowing. The data illustrated indicated that the difference between the averages in case of early and mid-season was 12.76 which was more than Duncan value at (2, 52, α 0.01) which equals; (2.83)*(4.06)= 11.48, while the range was (2). Whereas, It was found that the difference between the averages in case of early and Late-Season was 20.39 which was more than Duncan value at (3, 52) which equals; (2.98)*(4.06)= 12.09 and the range was (3). While in case of comparison between med and late-season, the difference between the average was 7.63 which was less than Duncan value at (2, 52) which equals; (2.83)*(4.06)= 11.48. and the range was (2).

Comparison between Different Insects in Two Types of Sowings:

The analysis of variance indicated that there were significant differences for all treatments in the case of Aphid population. When comparing among different types of insects in this study undergo two methods of sowings (*Schizaphis graminum*, *Nezara viridula*, *Empoasca spp.* and predators) under imidacloprid treatment. It was found that the difference between the averages in case of *S. graminum* and *N. viridula* was 21.96 which was more than Duncan value at (2, 95, α 0.05) which equals; (2.8)*(5.93) = 16.60, while the range was (2) and SE=Sqrt(MSE/n) =5.93. Whereas, it was found that the difference between the averages in case *S. graminum* versus *Empoasca spp.* and *S. graminum* versus predators equal 18.62 and 28.81 respectively, when compared with Duncan value at (3, 95, α 0.05) & (4, 95, α 0.05) which were 17.49 and 18.08 respectively. Thus, there were significant differences between *S. graminum* versus *Empoasca spp.*, *S. graminum* versus predators in the same type of sowing (drill type). (Table. 5).

Whereas when comparing between *S. graminum* in drill type method versus *S. graminum*, *Nezara viridula*, *Empoasca spp.*, and predators in broadcast method, it was found that the average difference between each other were 2.8, 16.04, 18.79 and 18.33 respectively, when compared with Duncan values at (5, 95, α 0.05), (6, 95, α 0.05), (7, 95, α 0.05) and (8, 95, α 0.05) were; 18.5, 18.8, 19.03 and 19.33 respectively. Therefore, no significant differences occur between *S. graminum* in drill type method versus *S. graminum*, *Nezara viridula*, *Empoasca spp.* in Broadcast sowing method, While, there was a significant difference in case of *S. graminum* in drill type method versus predators in broadcast method (Table 5& Fig. 3).

Comparison between No. of Seeds/Spike and Germination% in Two Types Of Sowings:

The Data illustrated in table (6) indicated that No. of seeds/spike, Weight of 100 seeds (gm) and Germination% in Broadcast sowing recorded 23.68, 27.46 and 30.77 increasing percentages compared with untreated control respectively, table (6). Also, in the case of Drill sowing it was found that the increasing percentages in No. of seeds/spike, Weight of 100 seeds (gm) and Germination were, 17.95, 24.56 and 27.54 respectively. Furthermore, when comparing between the two types of sowing in No. of seeds/spike, Weight of 100 seeds (gm) and Germination increasing%, this difference could be given arbitrary value which called No. of folds, the results in table (6) showed that the No. of seeds/spike, Weight of 100 seeds (gm) and Germination increasing% in Broadcast sowing were more than that in Drill sowing by 1.31, 1.11 and 1.11 respectively, (Table, 6 & Fig., 4).

Table (1): Reduction percentages of *Schizaphis graminum Nezara viridula* L. *Empoasca spp.*, associated predators; *Chrysoperla carena*, *Labidura riparia*, *Scymunus spp.* and true spiders in two types of sowing; broadcast sowing and drill sowing after dressing with imidacloprid.

date of examination	Drilling sowing				Broadcast sowing			
	Schizaphis graminum	Nezara viridula	*Empoasca spp.*	Predators	Schizaphis graminum	Nezara viridula	*Empoasca spp.*	Predators
Reduction % in Early season Drill sowing					Reduction % in Early season Broadcast sowing			
12/12/2017	66.6	-	75	-	75	-	60	-
12/19/2017	63.1	-	38.4	-	66.6	-	42.8	-
12/26/2017	28.5	33.3	20.8	-	21.1	50	15.3	-
1/2/2018	48.6	50	33.3	-	16.6	50	30.2	66.6
1/9/2018	25.6	-	11.7	-	41.6	50	26.6	66.6
Mid-season Drill sowing					Mid-season Broadcast sowing			
1/16/2018	38.7	66.6	47.7	20	19.4	100	9.3	66.6
1/23/2018	15.7	50	44	25	38.4	0	32.7	33.3
1/30/2018	44.6	33.3	11.7	12.5	47.8	50	28.1	12.5
2/6/2018	52.7	33.3	22.9	20	41.1	40	20	25
2/13/2018	43.4	-	10	23.1	49.1	18.1	4.1	10
2/20/2018	40.4	7.1	23.1	10.5	47.2	13.3	16.6	25
Late-season Drill sowing					Late-season Broadcast sowing			
2/27/2018	42.6	33.3	20	22.2	28.8	-	20	14.2
3/6/2018	32.2	-	50	18.1	38.8	14.2	100	20
3/13/2018	52.9	9.1	-	15.3	32.5	25	-	23.0
3/20/2018	42.8	7.1	-	29.4	40.4	7.1	-	20
3/27/2018	56	13.3	-	16.6	44.4	13.3	-	16.6
4/3/2018	30.7	15.3	-	14.2	28.5	21.4	-	14.2

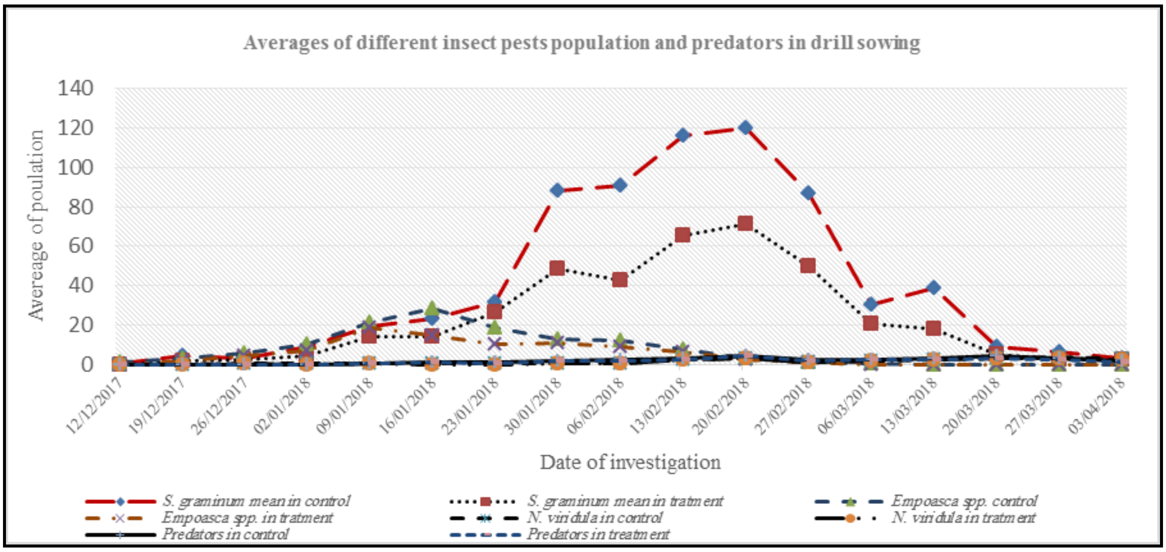

Fig. (1): Averages of different insect pest's population and predators in drill sowing.

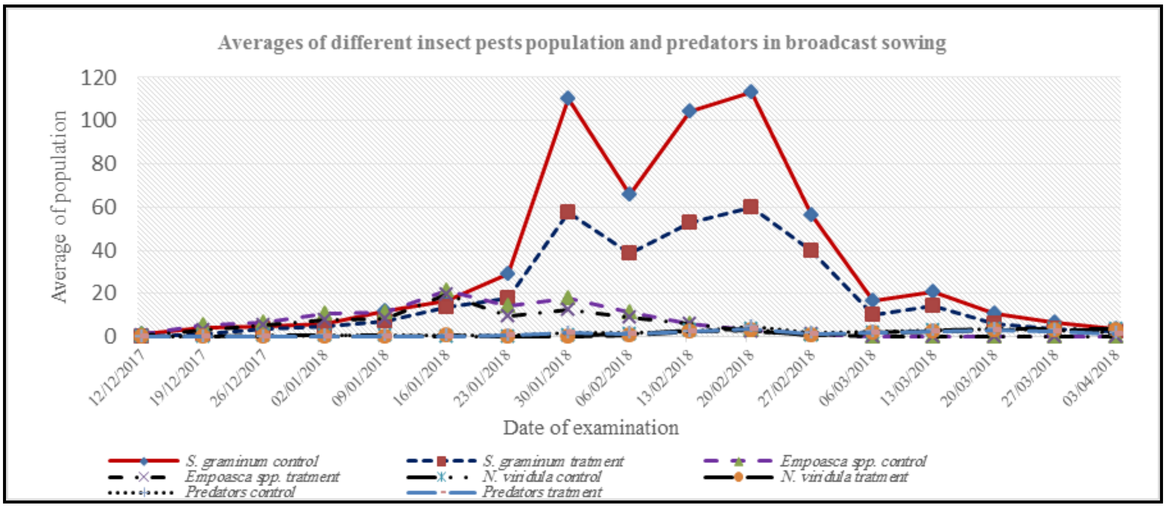

Fig. (2): Averages of different insect pest's population and predators in broadcast sowing.

Table (2): Analysis of variance (ANOVA) for *Schizaphis graminum*, *Nezara viridula*, *Empoasca spp.*, and Predators under imidacloprid treatment, drilling sowing methods and their interactions in the field.

Source of variation	Degree of freedom	SS	Mean squares	F. value	F. tabulated
Between season periods (S)	2	1486.31	743.15	6.50**	(2,52, α<0.05) = 5.06
Between insects (I)	3	4072.53	1357.51	11.87**	(3,52, α<0.01) =4.20
Interaction (S*I)	6	4306.12	717.68	6.27**	(6,52, α< 0.01) =3.18
Error	52	5943.80	114.30		

SE= sqrt (114.30/17) = 2.59 between insects (I); Duncan method.

Table (3): Analysis of variance (ANOVA) parameters for *Schizaphis graminum*, *Nezara viridula*, *Empoasca spp.*, and predators under imidacloprid treatment, broadcast sowing methods and their interactions in the field.

Source of variation	Degree of freedom	SS	Mean squares	F. value calc.	F. tabulated
Between season periods (S)	2	4353.592	2176.796	5.48**	(2,24, α< 0.01) = 5.06
Between insects (I)	3	965.7125	321.9042	0.81ns	(3,24, α< 0.05) =3.79
Interaction (S*I)	6	61.15919	10.1932	0.025ns	(6,24, α< 0.05) =2.29
Error	52	20629.17	396.7149		
SE= 4.06 between season period according to Duncan method.					

*= significant at (α 0.05), ** = high significant at (α 0.01), ns= non-significant

Table (4): Average of insect reduction during all season periods in two types of cultivation; drill and broadcast sowing.

Period	Drill sowing				Broadcast sowing			
	Schizaphis graminum	*Nezara viridula*	*Empoasca spp.*	Predators	*Schizaphis graminum*	*Nezara viridula*	*Empoasca spp.*	Predators
Early season	46.4±8.49	16.6±8.35	35.8±10.85	-	44.18±5.2	30±0.0	34.9±3.41	26.6±0.0
Mid- season	39.2±5.1	31.7±10.2	26.5±6.51	18.5±2.6	40.5±4.55	36.9±8.46	18.4±4.44	28.7±8.36
Late-season	42.8±4.22	13.01±4.6	11.6±8.33	19.3±2.3	35.5±2.68	13.5±3.73	20±16.32	18±1.45
Average	42.65^{a}	20.6^{c}	24.03^{c}	13.43^{d}	40.1^{a}	26.8^{c}	24.4^{c}	24.4^{c}

Table (5): Analysis of variance (ANOVA) for comparing between different insects in this study in the two methods of sowing, *Schizaphis graminum*, *Nezara viridula*, *Empoasca spp*., and predators under imidacloprid treatment in two methods of sowing.

Source of variation	D.F.	SS	Mean squares	F. value calc.	F. Estimated
between insects	7	1987.249	283.8927	1.009005^{ns}	2.1 (7,95, 0.05)
between Sowing methods	1	171.0614	171.06	0.607977^{ns}	3.94 (1,95, 0.05)
Insects x Sowing methods	7	13102.06	1871.722	6.652431**	2.1 (7,95, 0.01)
Error	95	26729.12	281.3591		

NS= non-Signiant, ** = significant at (α 0.01). D.F.= Degree of freedom

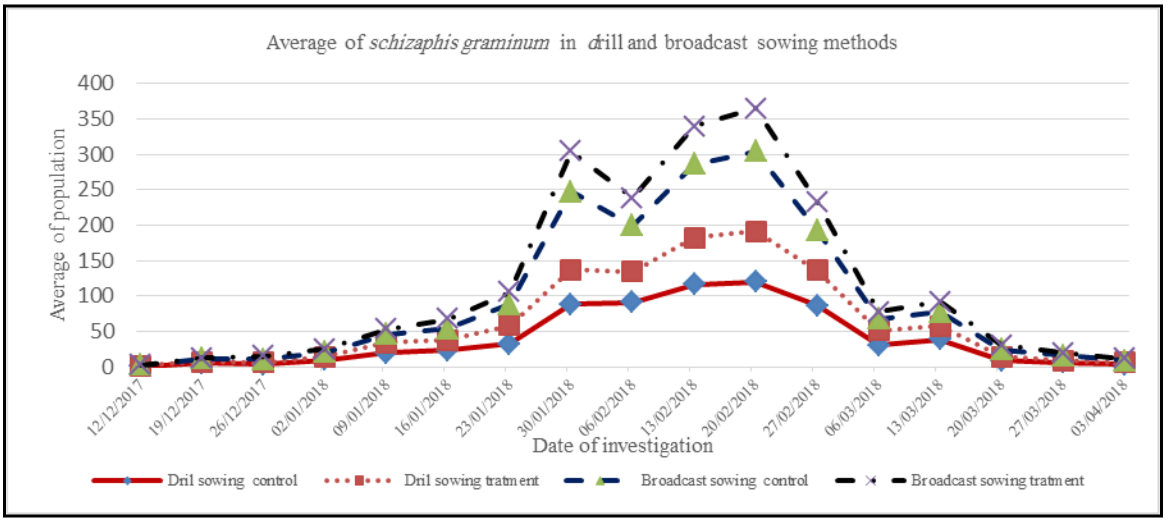

Fig. (3): Average of *Schizaphis graminum* in two methods of sowing; drill and broadcast.

Table (6): Some characters of wheat crop in fields after treatment with imidacloprid as seed dressing.

Charterers	Broadcast sowing			Drill sowing			No of folds
	Untreated	Treated	increase%	Untreated	treated	increase%	Bi-methods
No. of seeds/spike	38±2.0^{b}	47±3.16^{a}	23.68	39±2.4^{b}	46±2.27^{a}	17.95	1.31
Weight of 100 seeds (gm)	5.21±0.60^{b}	6.65±0.84^{b}	27.46	5±0.40^{b}	6.23±0.85^{b}	24.56	1.11
Germination %	65±3.5^{b}	85±4.08^{a}	30.77	69±3.80^{b}	88±4.02^{a}	27.54	1.11

Means ±SD followed by the same letter are not significantly different, while Means ±SD followed by different letter are significantly different from each other at ($\alpha_{0.05}$).

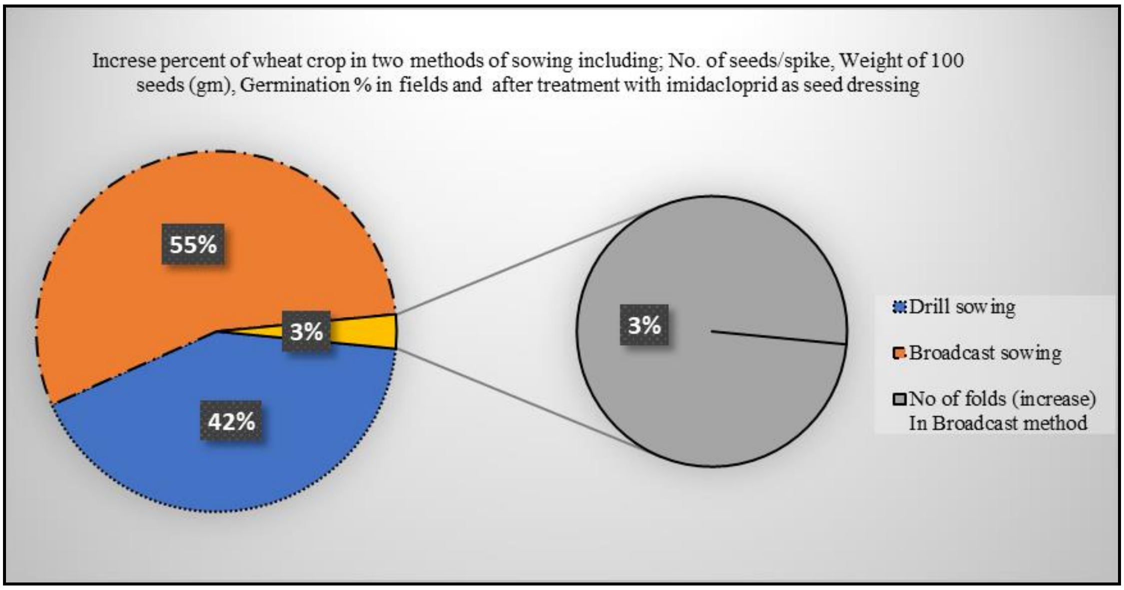

Fig. (4): Comparative increasing% of No. of seeds/spike, Weight of 100 seeds (gm), Germination % in wheat crop in two methods of sowing as well as no. of folds of increasing after treatment with imidacloprid as seed dressing.

DISCUSSION

By illustrating the effect of seed dressing with imidacloprid on insect population density in two methods of sowing. It was found that according to analysis of variance. there was a significant variation among the insect's reduction in all-season periods as a result of treatment of the wheat seeds before sowing with imidacloprid in the drill sowing.

Generally, this study showed that using imidacloprid was very useful in aphid control than the other insects, as well as the lowest insect which was affected by this insecticide was predators whose average was (13.34).

Furthermore, observation of insect's population in different season periods under wheat grain treatment with imidacloprid in the field were objected to an analysis of variance, the data showed that there was highly significant difference between season periods as well as between insects at ($\alpha_{0.01}$)

When Comparing between insects in different periods; early, mid and late-season in drill sowing. It was found that there was high significant difference between them in early season, while there was no significant difference between the early, mid and late season in *S. graminum* reduction. Furthermore, there was no significant difference between early and late season in the *N. viridula* population. While in mid-season the reduction of *N. viridula* was highly significant compared with that in early and late-season. Furthermore, in case of Empoasca spp, the reduction in the early season was highly significant than that in mid and late-season. Moreover, the predator reduction in the early, mid and late-season was not significant.

Whereas, when comparing between insects in different periods; early, mid and late- season in Broadcast sowing, the results revealed showed that the best period of the effect of the insecticide used in this study was the early season, Table (4). Meanwhile, the analysis of variance showed there was no significant variation between the reduction effect of treatment of different insects, according to Duncan analysis.

Furthermore, when Comparing between different insects in two types of sowings. there was no significant effect of the treatment when comparing *S. graminum* in different sowing methods, also there was non-significant effect of the treatment on *S.*

graminum in drill method with *N. viridula*, *Empoasca spp*. and predators table (Table. 6). Generally, we could be concluded that the imidacloprid is useful insecticide for sucking insect's management in wheat plants when it used as seed dressing in many sowing methods. On the other hand, it has less effect on predators.

When comparing the effect of seed dressing with imidacloprid on No. of seeds/spike, Weight of 100 seeds and Germination% of the wheat crop in two sowing methods. The results indicated that there was significant difference between treatments and untreated control in both types of sowing, especially in No. of seeds/spike and germination percentages, whereas, there was no significant difference in case of Weight of 100 seeds (gm) between treated and untreated control in both types of sowing according to Duncan analysis at ($\alpha_{0.05}$).

Generally, No. of seeds/spike, Weight of 100 seeds (gm) and Germination increasing% in Broadcast sowing were more than that in Drill sowing by 1.31, 1.11 and 1.11 respectively. Therefore, it could be concluded that the broadcast sowing is suitable economically for farmers than drill sowing method when using imidacloprid as seed dressing before cultivation for sucking insects' control as well as predators.

These results are in accordance with that of Macharia *et al.* (1999) who concluded that there is a significant efficacy of seed dressing with some insecticides for *D. anoxia* control. Similarly, Patil *et al.* (2003) and Royer *et al.* (2005) illustrated that the seed dressing with Imidacloprid before sowing decreased sucking insect pest's population during cultivation seasons, like leafhoppers and cereal aphids. Typical LC_{50} values different from 0.82 to 0.88 ng/insect, also it varies from species to another according to the size of the pest, also the reported half-lives of imidacloprid in the soil are ranged from 28-1250 days (Dve Goulson, 2013).

Imidacloprid found to be highly effective against leafhoppers (*Empoasca spp*), *Bemessia tabaci* and *Thrips tabaci* along with the higher yield, (Sasikumar et al., 2015). Using the insecticides as seed dressing results in smaller proportion of the insecticide in the crop than do the spray application to foliage. Thus, the seed dressing is mainly stated to give accurate prophylaxis to the crop (Jeschke *et al.,* 2011).

Furthermore, (Culp *et al.*, 2006; Anon, 2007) reported that many programs such as water-monitoring programs do not screen secondary metabolites of neonicotinoid insecticides (imidacloprid olefin). Also, many trials insure that the using of imidacloprid as seed dressing leads to significant impact on the insect population level. But no doubt that most of the other organisms will be exposed to it, by the way, these mentioned results are supporting our results partially.

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Conflict of Interest:

The authors declare that there is no conflict of interest

Authors Contributions:

AS and SQ conceived the study, AS and SQ conducted the experiments, AS analysed the data, AS and SQ wrote the manuscript, all authors read and approved the final version.

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ARABIC SUMMARY

الفعالية المقارنه للايميداكلوبريد كأحد مبيدات معاملة البذور على الحشرات الثاقبه الماصه ومفترساتها في محصول القمح

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أجريت هذه الدراسة في محطه البحوث الزراعية بسخا – محافظة كفر الشيخ – مصر، علي محصول القمح جيزه 171 – في الموسم الزراعي (2017-2018) . من المعروف ان الحشرات الثاقبه الماصه من اخطر الحشرات التي تصيب محصول القمح، واهم هذه الحشرات هي حشره المّن، ويرجع الضررالاقتصادي لهذه الافات الي امتصاص العصاره النباتية و الندوه العسلية و نقله الامراض الفيروسية للنبات، ولقد صممت هذه الدراسة لغرض دراسة تأثير الاميداكلوبرايد (نوفيدور FS 600) كأحد المركبات الموصي بها كمعامل بذور علي حشرة مّن النجيليات - و البقة الخضراء - و الجاسيد *Nezara viridula, Empoasca spp. Schizaphis graminum* وكذلك ايضا تاثيره علي المفترسات ومنها اسد المّن و ابرة العجوز و الاسكيمنيس و العناكب المفترسه *Chrysoperla carena, Labidura riparia, Scymunus spp.* and spiders. في نوعين من الزراعه هي الزراعه الحراتي و الزراعه العفير.

لقد أظهرت النتائج ان هناك اختلاف في متوسطات الحشرات في الفترات المختلفه للموسم في كل من نوعي الزراعه، أي أن هناك تأثير معنوي لهذا المركب في النوعين المختلفين للزراعه سواء كان حراتي او عفير و ذلك نتيجة معاملة البذور قبل زراعتها. بينما لا يوجد تاثير معنوي لهذه المعامله علي من النجيليات في النوعين المختلفين من الزراعه عند مقارنتهما معا. بينما اثبتت الدراسه انه لايوجد فرق معنوي لتاثير الايمداكلوبرايد بين مَن النجيليات عند مقارنته بالبقه الخضراء و والجاسيد و كذلك المفترسات في الزراعه العفير مما يدل علي كفاءة المبيد في هذا النوع من الزراعة.

علي الصعيد الأخر بعد الحصاد تم تقييم عدد الحبات في السنبله الواحده و كذلك تقدير وزن كل مائة حبة، كما تم حساب نسبة الانبات في كل من الطريقتين المختلفتين في الزراعه بعد المعامله. اظهرت نتائج الدراسه ان عدد الحبات في كل سنبله في الزراعة العفير تزيد بنسبة1.31% عن الزراعة الحراتي , كذلك وزن كل مائة حبة في الزراعة العفير تزيد نسبة 1.11% عن الزراعة الحراتي و كذلك ايضا نسبة الانبات في الزراعه العفير تزية بنسبة 1.11% عن الزراعه الحراتي.

و لما كان الهدف من المعاملات هي مكافحة الحشرات الثاقبه الماصه لزيادة الانتاج، لذا يمكن القول بأن زراعه القمح بطريقة العفير بعد معاملته بالايميداكلوبرايد كان اكثر فاعلية عن طريقة الزراعة الحراتى لمكافحة الحشرات الثاقبة الماصة مما ادي الي زيادة الانتاج, لذا فهي افضل اقتصاديا للمزارع.