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Efficacy of certain Pre-harvest Sprays on the Incidence of Angoumois Grain Moth, *Sitotroga cerealella* Olivier in Long term seed Storage of Paddy

N. Sambasiva Rao*

Agricultural Research Station, Jangamaheswarapuram, Gurazala (Post), Guntur District, Andhra Pradesh – 522415, India

**Corresponding author*

A B S T R A C T

Among all the treatments Spinosad 45 SC @ 0.3 ml/l has recorded least mean progeny adults of 22.33 and 15.00 during 2017-18 & 2018-19, respectively when compared to 591.67 and 507.67 mean progeny adults in untreated control and the treatment differences are significant with each other at 180 days after storage (DAS). Similarly, Malathion 50 EC @ 2.0 ml/l has recorded second least mean progeny adults of 89.67 and 54.67 during 2017-18 & 2018-19, respectively and the treatment differences are significant between Spinosad and Malathion pre harvest spray. The remaining chemical insecticides i.e. Chlorpyriphos 20 EC 2.5 ml/l, Dichlorovas 76 EC @ 2.0 ml/l, Cypermethrin 10 EC @ 1.0 ml/l has recorded high progeny build up when compared to Spinosad and Malathion and proved ineffective in reducing progeny buildup of *Sitotroga* in storage. The germination per cent in untreated control, Neem oil @ 0.5% and NSKE @ 5% is reduced gradually due to *Sitotroga* damage and reached to 81.3 %, 83.0 % and 84.7 % (2017-18) & 83.7 %, 85.3 % and 85.7 % (2018-19), respectively at 180 DAS, whereas the germination is retained in treatments Spinosad 45 SC @0.3 ml/l and Malathion 50 EC @ 2 ml/l at 90.7 % and 90.0 % (2017-18) & 91.0 % and 90.3 % (2018-19), respectively, due to least damage by *Sitotroga* at 180 DAS. Spinosad 45 SC @ 0.3 ml/l has recorded least number of total progeny adults of 46.33 (2017-18) and 29.33 (2018-19) in 180 days storage and it is most effective treatment in reducing progeny build up of *Sitotroga*. The next best treatment is Malathion 50 EC @ 2.0 ml/l which recorded total progeny adults of 212.00 (2017-18) and 175.67 (2018-19) in 180 days of storage under ambient conditions.

Keywords

Angoumois grain moth, *Sitotroga cerealella*, Paddy seed, Pre harvest spray

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Introduction

The grain moth, *Sitotroga cerealella* Olivier is a serious lepidopteran hidden pest which starts its initial infestation at field stage during grain maturity of the crop and gets transferred to the storage godowns for cyclic multiplication. Thus it is considered as a 'major pest' of storage in sub tropical regions. Hence, it is highly justified to control or manage the pest during the grain maturity stage itself in the field condition so as to reduce the pest load to the storage godowns. This moth first lays its eggs singly on the grains in the standing crop

itself and later transfer to the storage godowns, becomes a serious problem. Since 1950s, chemical insecticides have been used extensively in grain storage facilities to control stored product insect pests.

Contact insecticides, such as Malathion, Chloropyriphos, or Deltamethrin are sprayed directly on grain/seed in the storage structures to provide protection from the infestation of Angoumois grain moth, *Sitotroga cerealella.* as a curative measure. The level of infestation in the field determines the level of infestation in the store such that higher field infestation leading to higher infestation in the store (Floyd, 1970; Emana, 1993). Ramamurthy and Venugopal (1997) found that Neem oil at 3% significantly checked the damage of *Sitotroga* and it was followed by neem oil at 2 %, Malathion at 0.1 %, NSKE at 3.0 % and Endosulfan at 0.04 % which were all at par with each other in reducing the damage due to *Sitotroga*.

Dakshinamurthy and Regupathy, 1992 reported that pre harvest spray of Fenvalerate (0.002%) was the most effective treatment, followed by 0.04% monocrotophos and 0.05% malathion in reducing the incidence of *Sitotroga* in storage. With regard to time of application, two sprayings once at milky stage and the second at 10 days thereafter was significantly effective in controlling the grain moth, *Sitotroga cerealella* in field conditions on Jowar. Lele and Kabeh (2004) reported that neem seed oil (NSO) 20ml/l and aqueous neem seed extract (ANSE) 50 g/l applied twice or thrice in standing crop at weekly intervals significantly reduced the number of eggs laid by the bruchids on Cowpea pods.

Muthu kumar *et al*. (2016) suggested that any management strategies in terms of chemical spray and others are available for field carried population of *S. cerealella*, they may be coincided during 2 to 5 week period after reaching roasting stage for it effective control. It was also suggested that the pre harvest strategy can very well be followed for crops grown for seed purpose which has to be stored for long time without quality detoriation, rather than grain purpose which goes to consumption immediately.

Keeping the above in view, an experiment was conducted with available insecticides to check their efficacy as single pre harvest spray 10 days prior to harvest to reduce *Sitotroga* build up in storage of paddy seed.

Materials and Methods

The experiment was conducted at Agricultural Research Station, Jangamaheswarapuram, Gurazala, Guntur, Andhra Pradesh during the year 2017-18 & 2018-19. The popular Rice variety of Andhra Pradesh i.e. BPT 5204 (Samba Mashuri) was selected for this study. The crop was sown during kharif, 2017 and Kharif, 2018 at Agricultural Research Station, Jangamaheswarapuram in Randomized Block Design with 10 treatments and 3 replications.

The plot size selected was 4 X 4 meters and 0.5 meter gap was provided between each plot. The details of treatments were Neem oil spray @ 0.5%, Neem oil spray @ 0.75%, NSKE @ 5 %, NSKE @ 7.5 %, Chloropyriphos 20 EC @ 2.5 ml/l, Cypermethrin 10 EC @ 1.0 ml/l, Dichlorovas 76 EC @ 2.0 ml/l, Malathion 50 EC @ 2.0 ml/l, Spinosad 45 SC @ 0.3 ml/l and untreated control.

The above treatments were imposed on standing crop of Paddy 10 days prior to harvest with knap sack sprayer. After harvest of each plot, 500 g of paddy seed sample were collected randomly treatment wise and replication wise and allowed them for proper drying and kept them in plastic containers

(HDPE) of 1 litre capacity. Sufficient aeration was provided to the seed by replacing the plastic cap of the container with muslin cloth and tied with rubber band. All the containers were kept in laboratory under ambient conditions and allowed for adult emergence.

Observations were recorded in monthly intervals starting from 30 days after storage (DAS) to 180 DAS (up to 6 months). The adults emerged from 500 g of seed were counted replication wise and discarded the adults (both live & dead) upon counting.

The germination test (Paper Towel method) was also conducted every month after counting of adults to check the effect of insecticides and pest damage on germination of seed. In each replication 100 seeds were kept and three such replications were maintained for conducting germination test.

Results and Discussion

Among Neem based treatments NSKE @ 7.5 % has recorded lowest mean progeny adults of 68.33 and 34.67 at 90 days after storage (DAS) during 2017-18 and 2018-19, respectively and significantly different from other treatments of Neem namely, NSKE 5%, Neem oil spray 0.5 % and Neem oil 0.75 % at 90 DAS (Table 1).

Among chemical insecticides Spinosad 45 SC @ 0.3 ml/l has recorded only 8.00 and 4.00 mean progeny adults at 90 DAS, followed by Malathion 50 EC @ 2.0 ml/l has recorded 54.67 and 27.00 mean progeny adults during 2017-18 & 2018-19, respectively and the treatment differences are significant with each other. The remaining chemical insecticides are less effective in reducing progeny buildup when compared to Spinosad and Malathion.

At 180 DAS, Among all the treatments Spinosad 45 SC @ 0.3 ml/l has recorded least mean progeny adults of 22.33 and 15.00 during 2017-18 & 2018-19, respectively when compared to 591.67 and 507.67 mean progeny adults in untreated control and the treatment differences are significant with each other. Similarly, Malathion 50 EC @ 2.0 ml/l has recorded second least mean progeny adults of 89.67 and 54.67 during 2017-18 & 2018-19, respectively and the treatment differences are significant between Spinosad and Malathion spray (Table 1).

Imposition of treatments 10 days prior to harvest of Paddy crop

500 g of Paddy kept in plastic containers (HDPE) in Laboratory

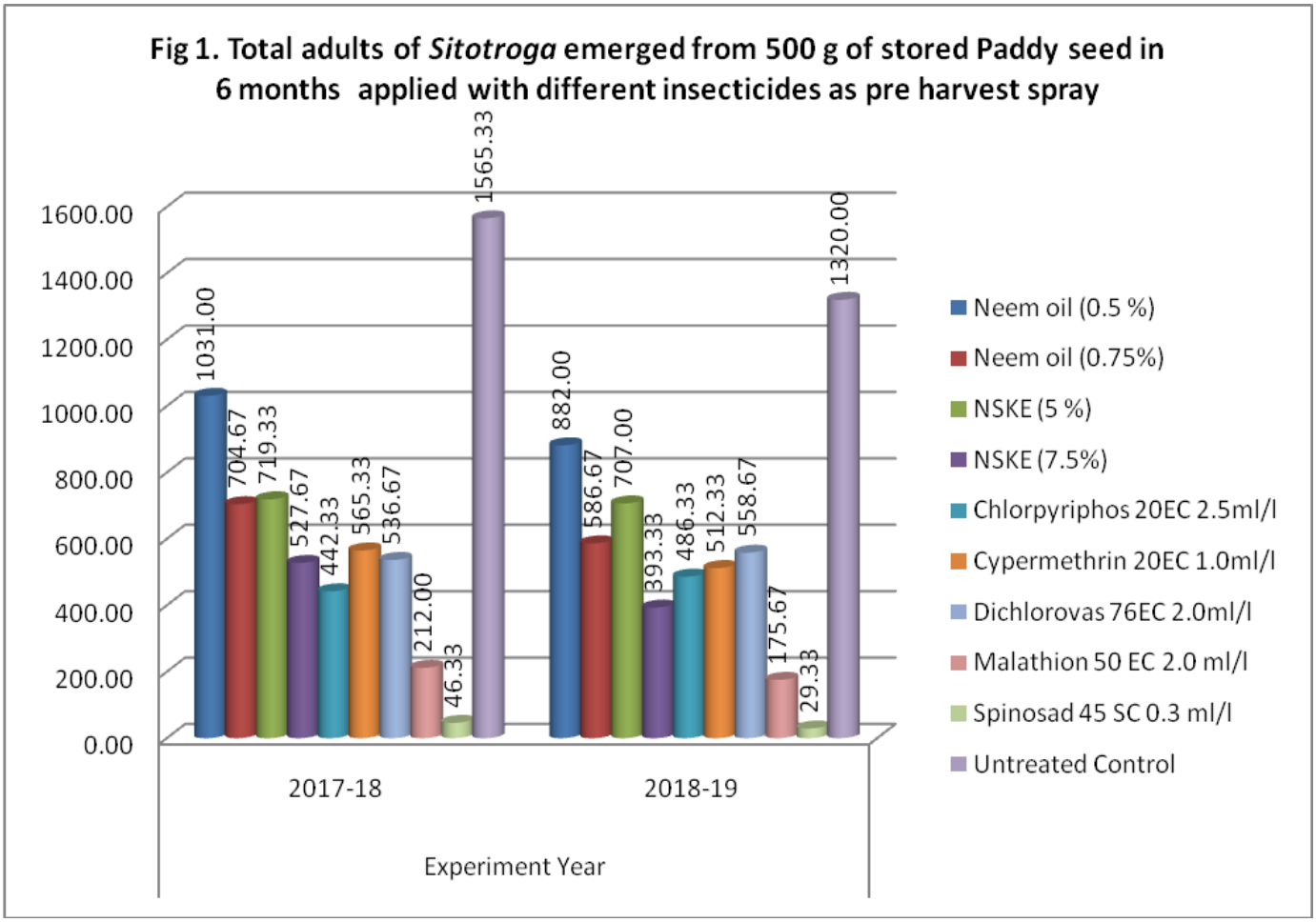
Table.1 Efficacy of pre harvest spray in Paddy on *Sitotroga* build-up in long term seed storage under ambient conditions

S. No	Name of the Treatment	No. of mean adults emerged											
		30 DAS		**60 DAS**		**90 DAS**		**120 DAS**		**150 DAS**		**180 DAS**	
		2017-18	**2018-19**	**2017-18**	**2018-19**	**2017-18**	**2018-19**	**2017-18**	**2018-19**	**2017-18**	**2018-19**	**2017-18**	**2018-19**
1	Neem oil spray @ 0.5%	4.33 (2.27)	8.67 (3.09)	65.67 (7.99)	71.33 (8.47)	195.00 (13.99)	156.33 (12.47)	58.67 (7.70)	88.00 (9.41)	268.33 (16.37)	201.67 (14.21)	439.00 (20.93)	356.00 (18.84)
2	Neem oil spray @ 0.75%	2.67 (1.88)	3.33 (2.08)	17.00 (4.19)	14.33 (3.91)	145.00 (12.07)	79.00 (8.91)	45.33 (6.39)	63.33 (8.00)	159.33 (12.60)	138.00 (11.71)	335.33 (18.29)	288.67 (17.00)
3	NSKE @ 5 %	3.67 (2.05)	5.00 (2.43)	18.33 (4.38)	28.33 (5.35)	128.33 (11.37)	117.33 (10.85)	36.00 (6.06)	76.00 (8.74)	188.33 (13.75)	167.00 (12.95)	344.67 (18.39)	313.33 (17.54)
4	NSKE @ 7.5 %	0.67 (1.28)	1.67 (1.61)	13.67 (3.82)	9.33 (3.06)	68.33 (8.31)	34.67 (5.90)	27.67 (5.34)	47.67 (6.95)	123.00 (11.10)	109.00 (10.48)	294.33 (17.10)	191.00 (13.82)
5	Chlorpyriphos 20 EC @ 2.5 ml/l	2.67 (1.82)	10.00 (3.31)	40.33 (6.40)	91.00 (9.41)	99.00 (9.99)	103.67 (10.14)	15.33 (4.00)	37.67 (6.18)	98.67 (9.94)	76.33 (8.73)	186.33 (13.67)	167.67 (12.96)
6	Cypermethrin 10 EC @ 1.0 ml/l	1.00 (1.38)	5.33 (2.48)	14.33 (3.90)	16.67 (4.17)	205.67 (14.37)	63.67 (8.00)	28.67 (5.43)	56.00 (7.53)	161.00 (12.68)	169.00 (12.95)	154.67 (12.42)	201.67 (14.22)
7	Dichlorovas 76 EC @ 2.0 ml/l	2.33 (1.79)	8.67 (3.09)	31.00 (5.60)	41.33 (6.42)	145.00 (11.98)	160.33 (12.68)	36.00 (5.89)	44.67 (6.66)	141.67 (11.82)	110.33 (10.44)	180.67 (13.43)	193.33 (13.90)
8	Malathion 50 EC @ 2.0 ml/l	0.33 (1.14)	3.00 (1.99)	9.00 (3.09)	11.33 (3.43)	54.67 (7.41)	27.00 (5.14)	15.33 (3.92)	18.33 (4.32)	43.00 (6.50)	61.33 (7.83)	89.67 (9.40)	54.67 (7.30)
9	Spinosad 45 SC @ 0.3 ml/l	0.00 (1.00)	0.00 (1.00)	3.00 (1.99)	1.33 (1.47)	8.00 (2.97)	4.00 (1.87)	5.33 (2.40)	5.67 (2.48)	7.67 (2.82)	3.33 (1.94)	22.33 (4.78)	15.00 (3.95)
10	Untreated Control	15.33 (4.00)	12.33 (3.64)	170.67 (12.93)	110.33 (10.44)	228.33 (15.14)	162.00 (12.69)	137.00 (11.69)	217.33 (14.64)	422.33 (20.53)	310.33 (17.59)	591.67 (24.16)	507.67 (22.48)
	CD (0.05)	0.879	0.587	2.052	2.126	1.462	2.310	2.309	2.016	2.415	2.315	3.558	2.868
	CV	27.55	13.85	22.03	22.08	7.92	15.19	22.89	15.69	11.92	12.40	13.60	11.77

* Values in parenthesis are square root transformed values

Table.2 Effect of pre harvest spray in Paddy seed germination in long term storage under ambient conditions

S. No	Name of the Treatment	Per cent germination of Seed											
		30 DAS		**60 DAS**		**90 DAS**		**120 DAS**		**150 DAS**		**180 DAS**	
		2017-18	**2018-19**	**2017-18**	**2018-19**	**2017-18**	**2018-19**	**2017-18**	**2018-19**	**2017-18**	**2018-19**	**2017-18**	**2018-19**
1	Neem oil spray @ 0.5%	92.3	93.7	91.7	92.3	89.3	91.3	87.0	90.3	85.3	88.7	83.0	85.3
2	Neem oil spray @ 0.75%	92.0	94.3	91.3	93.3	90.7	92.0	88.3	91.3	85.7	89.3	85.7	86.7
3	NSKE @ 5 %	93.0	94.3	92.3	93.0	90.3	91.3	87.7	90.7	86.3	89.3	84.7	85.7
4	NSKE @ 7.5 %	91.7	93.7	91.3	93.3	91.0	92.7	89.0	91.7	87.7	91.0	85.7	88.7
5	Chlorpyriphos 20 EC @ 2.5 ml/l	92.0	93.7	91.0	93.3	89.0	93.0	86.7	91.3	84.7	91.0	84.3	88.7
6	Cypermethrin 10 EC @ 1.0 ml/l	93.0	94.0	92.3	93.3	88.7	93.0	86.0	91.7	85.3	90.0	85.0	88.3
7	Dichlorovas 76 EC @ 2.0 ml/l	93.3	93.7	92.3	93.0	89.3	92.7	86.3	92.0	86.3	90.3	85.7	89.0
8	Malathion 50 EC @ 2.0 ml/l	92.0	94.0	91.7	93.7	91.3	93.0	91.0	92.0	90.7	91.3	90.0	90.3
9	Spinosad 45 SC @ 0.3 ml/l	92.3	94.3	92.0	93.7	91.7	93.3	91.0	92.3	91.0	91.7	90.7	91.0
10	Untreated Control	91.7	94.0	90.7	91.7	87.0	89.3	84.7	87.3	83.7	85.7	81.3	83.7
	CD (0.05)	NS	NS	NS	NS	NS	2.236	3.822	NS	3.387	2.676	3.322	2.639
	CV	1.22	0.70	1.41	1.30	1.91	1.41	2.54	1.86	2.28	1.74	1.58	1.75



From the above study it is concluded that single pre harvest spray of Spinosad 45 SC @ 0.3 ml/l, 10 days prior to harvest has completely protected the paddy seed from damage by Sitotroga up to 6 months in storage. Malathion 50 EC @ 2.0 ml/l is also proved to be effective as pre harvest spray in reducing *Sitotroga* build up in storage of Paddy seed and the results are in agreement with Dakshinamurthy and Regupathy, 1992 who reported that Malathion 0.05% protected the seed from *Sitotroga* damage as pre harvest spray. The above results are in agreement with the findings of Muthu kumar *et al*. (2016) where the author suggested that any management strategies in terms of chemical spray and others are available for field carried population of *S. cerealella*, they may be coincided during 2 to 5 week period prior to harvest. Ramamurthy and Venugopal (1997) found that Neem oil at 3% significantly checked the damage of *Sitotroga* and it was followed by neem oil at 2 %, NSKE at 3.0 %. Neem oil 0.5 % & 0.75 % only were studied in present study 2 % or 3 % could have protected the seed completely from damage. Among the Neem based formulations NSKE @ 7.5 % as single pre harvest spray proved to be effective in reducing the population build up of *Sitotroga* in long term seed storage when compared to Neem oil and NSKE 5.0 per cent.

The remaining chemical insecticides i.e. Chlorpyriphos 20 EC 2.5 ml/l, Dichlorovas 76 EC @ 2.0 ml/l, Cypermethrin 10 EC @ 1.0 ml/l has recorded high progeny build up when

compared to Spinosad and Malathion and proved ineffective in reducing progeny buildup of *Sitotroga* in storage. The order of efficacy of all tested insecticides based on mean progeny adult emergence of *Sitotroga* were Spinosad > Malathion > NSKE > Chlorpyriphos > Dichlorovas > Cypermethrin > Neem oil. The results of germination per cent of seed at monthly intervals up to 180 DAS in different treatments to find out the effect of pre harvest spray on grain quality is furnished in Table 2.

A uniform germination of seed was recorded after 30 days of treatment and the treatment differences are not significant during both the years of study, however in general more germination per cent was recorded in all the treatments in the year 2018-19 when compared to 2017-18. Similar trend of germination was observed at 60 DAS and 90 DAS also and the treatment differences are not significant.Later on, the germination per cent in untreated control, Neem oil @ 0.5% and NSKE @ 5% is reduced gradually due to *Sitotroga* damage and reached to 81.3 %, 83.0 % and 84.7 % (2017-18) & 83.7 %, 85.3 % and 85.7 % (2018-19), respectively at 180 DAS, whereas the germination is retained in treatments Spinosad 45 SC @0.3 ml/l and Malathion 50 EC @ 2 ml/l at 90.7 % and 90.0 % (2017-18) & 91.0 % and 90.3 % (2018-19), respectively, due to least damage by *Sitotroga* at 180 DAS.

The total number of adults emerged out of 500 g of Paddy seed in each treatment in 2017-18 and 2018-19 in 180 days period is furnished in Fig. 1. In untreated control 1565.33 and 1320 progeny adults were emerged in 180 days storage period during 2017-18 and 2018-19, respectively followed by Neem oil spray @ 0.5 % has recorded 1031 (2017-18) and 882 (2018-19) progeny adults and it is least effective treatment among all the treatments tested.

On the other hand, Spinosad 45 SC @ 0.3 ml/l recorded least number of progeny adults of 46.33 (2017-18) and 29.33 (2018-19) at 180 days storage period and it is most effective treatment in reducing progeny build up of *Sitotroga*. The next best treatment is Malathion 50 EC @ 2.0 ml/l recorded total progeny adults of 212.00 (2017-18) and 175.67 (2018-19) in 180 days of storage.

All the other treatments of chemical insecticides i.e. Chlorpyriphos 20 EC 2.5 ml/l, Dichlorovas 76 EC @ 2.0 ml/l, Cypermethrin 10 EC @ 1.0 ml/l and NSKE though able to reduce the build up of *Sitotroga* could not protect the seed completely like Spinosad and Malathion but they are proved better when compared to untreated control.

References

Dakshinamurthy, A., and Regupathy, A. 1992. Pre harvest spray of insecticides for the management of *Sitotroga cerealella* Olivier on Rice. Proceedings of the National symposium on Growth, Development & control technology of insect pests: 218-224

Emana, G. 1993. Studies on the distribution and control of Angoumois grain moth, *Sitotroga cerealella* (Olivier) (Lepidoptera: Gelechiidae) in Sidama administrative region. M. Sc. Thesis, Alemaya University of Agriculture, Alemaya, Ethiopia

Floyd, E.H., 1970. Relationship between maize weevil infestation in corn at harvest and progressive infestation during storage. Journal of Economic Entomology. 64: 408 - 411.

Lele, N.E.S., and Kabeh, J.D. 2004. Pre-harvest spray of neem seed products and Pirimiphos-methyl as a method of reducing field infestation of Cowpeas by storage Bruchids in the Nigerian

Sudan Savanna. International Journal of Agriculture and Biology. 6(6): 987-993

Muthu Kumar M, Raghumoorthi K N, Balasubramani V and Vijayakumar A. 2016. Impact of different maize cultivars on pre harvest infestation by *sitotroga cerealella* (olivier) (lepidoptera: gelechiidae), *Life Sciences Leaflets*. 71: 20-28

Ramamurthy, R., and Venugopal, M. S. 1997. Effect of plant products on the incidence of *Sitotroga cerealella* under field condition. Indian Journal of Entomology, 59(1): 8-10

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