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EVALUATION OF SEED SOAKING INSECTICIDES AGAINST INSECT PESTS OF SORGHUM

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ABSTRACT

In this study, seed soaking insecticide treatments i.e., thiamethoxam 25%WG @ 2.0 g/ l, clothianidin 50%WG @ 2.0 g/ l, dinotefuron 20%SG @ 1.0 g/ l, fipronil 5%SC@ 1.0 ml/ l, flonicamid 50%SG @ 0.50 g/ l + $CaCl_2$ @ 2% were evaluated in sorghum variety M 35-1 during 2018 and 2019. The pooled data in terms of deadhearts (DH) showed significant reduction in damage, with least % deadhearts by the shoot fly (*Atherigona soccata* Rondani) (17.96%), and stem borer (*Chilo partellus* Swinhoe) (4.32%); while shoot bugs (*Peregrinus maidis* Ashmead)/ plant (5.88) and number of aphids- *Rhopalosiphum maidis* (Fitch.)/ 3 cm^2 leaf area (23.57) were significantly reduced, along with maximum grain yield (1810 q/ ha) being with thiamethoxam.

Key words: *Atherigona soccata*, *Chilo partellus,* deadhearts, efficacy, *Peregrinus maidis*, *Rhopalosiphum maidis*, sorghum, seed soaking, thiamethoxam

Sorghum (*Sorghum bicolor* [L.] Moench) is the fifth most important cereal crop attacked by nearly 150 insect pest species. (Sharma, 1985). The sorghum shoot fly (*Atherigona soccata* Rondani) (Diptera: Muscidae) causes severe damage in the early stage and lasts up to four weeks. Maximum yield losses of 75.6% in grain and 68.6% in fodder had been reported by Pawar et al. (1984). The stem borer (*Chilo partellus* Swinhole) is also an important pest with about 4-45% deadhearts. Sorghum aphid (*Rhopalosiphum maidis* Fitch.) is distributed in Asia, Africa and Americas. It prefers to feed on the under surface of older leaves, resulting in premature drying of leaves, non-filling of grains and deterioration of fodder quality. The shoot bug *Peregrinus maidis* (Ashmead) is a major pest in rabi sorghum causing dual problem of direct loss by sucking the sap and indirect damage by transmitting sorghum stripe virus disease. Hence, it comes in the way of harvesting potential yield of grain and fodder. The consolidated strategy to manage this pest is combination of cultural practices, natural enemies, insecticides and host plant resistance. Chemical control alone proves expensive as it requires repeated applications against target pest which is not affordable for marginal farmers as well as safety concern to dairy animals (Gahukar, 1991). Therefore, the seed soaking seems to be a viable option for pest management system in terms of cost effectiveness and compatibility with other components of IPM (Balikai, 2011; Singh et al., 2017) and also protection of earlystage growth of the plants which is most susceptible to shoot fly devastation (Balikai and Bhagwat, 2009). This study evaluates different seed soaking insecticides and their cost-effective dose for the protection of most susceptible stage of the crop against attack by *A. soccata* and other sorghum insect pests.

MATERIALS AND METHODS

A field experiment was conducted at the Regional Agricultural Research Station, Vijayapur, Karnataka, during two consecutive rabi seasons of 2017-2018 and 2018-2019 under rainfed conditions in a randomized block design replicated thrice with seven treatments including farmer's practice (T6). The commercial sorghum variety M35-1 was planted at a spacing 45x15cm in a plot size of 10.8m^2, each having six rows. The seeds were soaked in chemicals for 5hr, dried in shade and used for sowing. The thinning of sorghum plants was done a week after emergence of the crop. The total number of plants and number of plants showing dead heart symptoms were recorded in each treatment on 28th day after emergence of the crop. The deadhearts caused by *A. soccata* was worked out and subjected to angular transformations before analysis. The *P. maidis* population was counted on randomly selected five plants in each treatment at 50 days after sowing. The *R. maidis* incidence was recorded when the incidence was at its peak during January second week (80 days after sowing). The data were subjected to angular transformations before statistical analysis. The data on infestation parameter (DH%), number of *R. maidis*, number of *P. maidis* and yield from individual trials year wise were pooled and analysed using two-way ANOVA as per Gomez and Gomez (1984).

RESULTS AND DISCUSSION

The efficacy data in terms of deadhearts (DH), number of *R. maidis* and *P. maidis* over two years when pooled and analysed it was observed that reduction in damage by *A. soccata* and *C. partellus* (as % deadhearts-DH) revealed significant differences with seed soaking insecticides. The range of % DH (30DAE) of *A. soccata* was 17.96 to 26.28 and *C. partellus* (45DAE) was 4.12 to 5.70 in all the seed soaking insecticides in comparison to recommended package of practices (RPP) (24.46 and 5.08) and control (40.13 and 7.19) during 2018-19 and 2019-20 (Table 1). The pooled data revealed significantly less DH due to *A. soccata* was observed with thiamethoxam 25%WG @2.0 g/ l (17.96%) and flonicamid 50%SG @ 0.50 g/ l (18.99%), both at par with each other. Similarly, the DH due to *C. partellus* was less in case of flonicamid 50%SG @0.50 g/ l (4.12%) followed by thiamethoxam 25%WG @2.0 g/ l (4.32%). Ravinder Kumar (2018) suggested that seed treatment with thiamethoxam 30 FS @ 10 ml/ kg reduced shoot fly incidence. The reduction in number of *P. maidis*/ plant and *R. maidis*/ 3 cm^2 leaf area revealed similar trend showing the superiority of thiamethoxam 25%WG @ 2.0 g/ l. Sandhu (2016) observed that seed treatment with thiomethoxam 30FS @ 5ml/ kg seed was effective in reducing *A. soccata* incidence; Yue et al. (2003) with European corn borer observed similar efficacy. Daware et al. (2012) concluded that either seed treatment with thiamethoxam 70WS @3g/ kg seed alone or in addition to seed treatment one spray with NSKE @ 5% @ 45 days after crop emergence, could be recommended against major pests of sorghum including shoot fly, shoot bug and aphids. The grain yield (q/ ha) revealed that an yield of 1818 q/ ha was obtained by seed soaking with thiamethoxam 25 WG @2.0 g/ l+ $CaCl_2$ @ 2%. Kumar and Prabhuraj (2007) confirmed the efficacy of seed treatment against *A. soccata*, grain yield and suggested that thiamethoxam 70WS @ 2g/ kg was superior.

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Table 1. Efficacy of seed soaking insecticides against insect pests of sorghum (Pooled data 2018-20)

	Treatment Details	*A. soccata* deadheart at 30 DAE (%)	*C. partellus* deadheart at 45 DAE (%)	No. of *P. maidis*/ plant	No. of *R. maidis*/ 3 cm^2 leaf area	Grain yield (q/ ha)
T_1	Seed soaking in thiamethoxam 25 % WG @ 2.0 g/ l + $CaCl_2$ @ 2%	17.96 (25.07) a	4.32 (11.99) a	5.88 (2.52) a	23.57 (4.91) a	1810
T_2	Seed soaking in clothianidin 50%WG @ 2.0 g/ l + CaCl2 @ 2%	26.28 (30.84) cd	4.27 (11.92) a	9.51 (3.16) a	29.82 (5.51) ab	1493bc
T_3	Seed soaking in dinotefuron 20%SG @ 1.0 g/ l + CaCl2 @ 2%	26.00 (30.66) cd	5.7 (13.81) a	10.40 (3.30) ab	30.47 (5.57) abc	1494bcd
T_4	Seed soaking in fipronil 5%SC@ 1.0 ml/ l + CaCl2 @2%	25.17 (30.11) cd	5.49 (13.55) ab	12.21 (3.57) a	31.76 (5.68) abc	1528
T_5	Seed soaking in flonicamid 50%SG @ 0.50 g/ l + CaCl2 @ 2%	18.99 (25.83) ab	4.12 (11.70) a	7.84 (2.89) a	25.78 (5.13) ab	1665
T_6	RPP: Soil application of carbofuran 3G (25 kg/ ha)- Seed treatment with chloropyriphos 20EC @ 5ml in 20ml of water- Spray of cypermethrin @ 0.50 ml/ l at 45 Days after emergence (DAE)	24.46 (29.64) cd	5.08 (13.03) ab	6.68 (2.68) a	26.27 (5.17) a	1798
T_7	UTC	40.13 (39.31) e	7.19 (15.55) b	19.43 (4.46) b	41.89 (6.51) c	1353d
CD (p= 0.05)		3.25	2.95	0.97	0.91	213.01
S.Em,±		1.08	0.97	0.32	0.30	70.30
CV (%)		11.17	12.67	13.02	12.13	13.45

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