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EVALUATION OF EFFECTIVE DOSAGE OF FENAZAQUIN 200 SC ACARICIDE AGAINST TWO SPOTTED SPIDER MITE IN TOMATO

Rohini Sugandi[1*], Kolli Bharghavi[2] and Shaila H.M.[3]
[1]Department of Entomology, University of Agricultural Sciences, Dharwad – 580005 (Karnataka), India.
[2]Department of Entomology, Professor Jayashankar Telangana state Agricultural University, Hyd-500030 (Telangana), India.
[3]AICRP on Sorghum, University of Agricultural Sciences, Dharwad – 580005 (Karnataka), India.
*Corresponding author E-mail: sugandi.rohini@gmail.com
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ABSTRACT

Investigation on effectiveness of fenazaquin 200 SC against two-spotted spider mites on tomato crop at Main Agricultural Research Station (MARS), University of Agricultural Sciences, Dharwad was carried out during *Kharif* 2021 and *Kharif* 2022. The findings demonstrated that fenazaquin 200 SC @ 625 ml/ha was effective at the specified percent control 3, 7 and 14 days after spraying. The greatest fruit yield (18.07 tons/ha and 18.53 tons/ha, respectively) was obtained with fenazaquin 200 SC @ 1250 ml/ha, which was found to be noticeably superior to other treatments. The next best treatments were Fenazaquin 200 SC @ 800 ml/ha (17.85 and 18.00 tons/ha) and Fenazaquin 200 SC @ 625 ml/ha (17 and 17.46 tonnes, respectively). Even though Fenazaquin 200 SC at 800 and 1250 ml/ha at higher dosages produced good outcomes, lower dosages that still produced results can be taken into consideration for use in the future.
Keywords **:** Bio-efficacy, Fenazaquin, Kharif, Tomato, Two spotted spider mite

Introduction

Tomato (*Lycopersicon esculentum* L.; Family: Solanaceae) is one of the most important vegetable crops of India. Tomato is grown in a wide range of climatic conditions across different states of India (Ao *et al*., 2014). The major tomato producing states in the country are Madhya Pradesh, Andhra Pradesh, Karnataka, Gujarat, Odisha, Chhattisgarh, West Bengal, Tamil Nadu, Bihar, Maharashtra, Uttar Pradesh, Haryana and Telangana. These states account for about 90% of the total production in the country. Over a hundred species insect pests have been identified that affect tomato crops across the world. Insects not only degrade the quality and amount of food, but they also serve as disease vectors (Mondal *et al*., 2019). The major insect pests of tomato crop in India are the tomato fruit borer (*Helicoverpa armigera*), jassid (*Amrasca biguttula biguttula*), white fly (*Bemisia tabaci*), mite (*Tetranychus urticae*), aphid (Aphis gossypii), leaf miner (*Liriomyza trifolii*) and tobacco caterpillar (*Spodoptera litura*) (Mondal *et al*., 2019). The two-spotted spider mite (*Tetranychus urticae*) is a serious tomato pest (Naveena *et al*., 2023 and Rapucel *et al*., 2021). A mite induced physiological shock can diminish tomato yields, resulting in smaller and fewer fruits, as well as sun-scalded fruits due to leaf loss (Manoj and Patil, 2021). It is responsible for 10 to 50% yield loss in tomato. On depletion of nutrient content, they form ballooning and gets migrated to another plant through the wind (Shukla *et al*., 2017). Most farmers' typical management tactics for vegetable pests, particularly mites, rely primarily on the administration of very toxic acaricides regularly with often ineffective

spraying equipment and dose. Because of their short life cycle and rapid reproductive rates, *T. urticae* has developed resistance to 96 chemicals, and 551 resistance cases have been reported worldwide (Mota-Sanchez and Wise, 2021). The mites prefer young canopies on the outside of plants, resulting in canopy damage (Herrmann *et al*., 2017). Typical symptoms include yellowing and bronzing of the leaves, as well as tiny yellowish white spots on the upper side of the leaf caused by chlorophyll depletion that grow into irregularly shaped white or greyish spots (Ashwini *et al*., 2023). The damage due to mites is reported up to an extent of 55 percent yield loss. To manage this insect pest, new molecular structure with unique modes of action have recently been created. As a result, in order to improve management, it is required to determine the efficacy of these sprayed pesticides.

Materials and Methods

The experiment on the efficacy of fenazaquin 200 SC against two spotted spider mite, *Tetranychus spp* on Tomato was conducted at Main Agricultural Research Station (MARS), University of Agricultural Sciences, Dharwad during *Kharif* 2021 and *Kharif* 2022. The treatments included four different doses of Fenazaquin 200 SC (500, 625, 800 and 1250 ml/ha); Fenazaquin 10 EC @ 1250 ml/ha and Spiromesifen 22.90% SC @ 400 ml/ha as standard checks with one untreated control. Totally seven treatments were imposed with three replications. The tomato hybrid Nayana was planted with row spacing of 90 cm and plant to plant spacing of 60cm.

Application of treatment

Two sprays were given; first spray was done when pest crossed ETL and second spray was given 15 days after the first spray using battery operated knapsack sprayer fitted with hallow cone nozzle.

Method of Observation

Population of two spotted spider mite, *Tetranychus spp* were recorded on top three leaves from 10 randomly selected plants (In 2 sq cm area in each leaf) of the crop at three different rows except the boarder rows in each plot at 3, 7 and 14 days after application of insecticides while pre-treatment count was done a day before each spraying. The pest population was subjected to $\sqrt{(x+0.5)}$ transformation before analysis. The yield per plot was recorded and was converted to Kg/ha.

Results and Discussion

***Kharif* -2021**

The mite damage was uniform on the day before the insecticides were applied, it ranged from 18.00 to 19.55 mites/6 cm^2 and there was no statistically significant difference between the treatments (Table 1).

I spray:

The mite population was found to be effectively reduced by fenazaquin 200 SC @ 800 ml/l on the third day after spraying; this was comparable to spiromesifen 22.90% SC @ 400 ml (2.30/6 cm^2) and fenazaquin 200 SC (2X) @ 1250 ml (2.30/6 cm^2). This was followed by fenazaquin 200 SC @ 625 ml/l and fenazaquin 200 SC @ 500 ml/l, which recorded 3.70 and 4.10 mites/6 cm^2, respectively. At 7 DAS, a similar pattern was noted, fenazaquin 200 SC @ 800 ml/l, which was better than other treatments, recorded the lowest population (1.30/6 cm^2).

At 14 DAS, the least mite population of 2.67 & 2.13/6 cm^2 was recorded by fenazaquin 200 SC @ 625 ml/ha & 800 ml/ha, demonstrating their effectiveness. The next best treatments, with mite populations of 2.33, 3.17, and 4.67/6 cm^2, respectively, were fenazaquin 10 EC @ 1250 ml/ha, fenazaquin 200 SC @ 500 ml/ha and spiromesifen 22.90% SC @ 400 ml/ha. Three, seven and fourteen-days following spraying at lower dosages, fenazaquin 200 SC @ 625 ml/ha was found to be effective, despite the higher dosage given cent percent control.

II Spray

After the second spray, on the third day, fenazaquin 200 SC @ 625 ml/ha and 800 ml/ha demonstrated their superiority by recording the lowest mite populations of 3.00 and 2.20/6 cm^2, respectively. These results were statistically comparable to each other. Next, fenazaquin 10 EC, spiromesifen 22.90% SC and fenazaquin 200 SC @ 500 ml/ha showed significantly better results than the control with records of 4.00, 4.25 and 5.00 mites/6 cm^2. At 7 DAS, a similar pattern in the effectiveness of various treatments was observed.

Fenazaquin 200 SC @ 625 ml/ha, 800 ml/ha and 1250 ml/ha observed a cent percent mite mortality at 14 DAS, which was equivalent to fenazaquin 200 SC @ 500 ml/ha (0.50/6 cm^2). The next best treatments in terms of supremacy were spiromesifen 22.90% SC and fenazaquin 10 EC @ 625 ml/ha, with mite counts of 1.50 and 2.00 /6 cm^2, respectively.

***Kharif* -2022**

There was no statistical difference between the treatments the day before the insecticides were sprayed, and the mite damage was equal, ranging from 16.50 to 18.00 mites/6 cm^2 (Table 2).

I spray:

After the third spraying day, fenazaquin 200 SC @ 800 ml/l was found to be effective in reducing the mite population, with the lowest population recorded at 2.42/6 cm^2. This result was statistically comparable to standard check spiromesifen 22.90% SC@ 400 ml (2.44/6 cm^2) and fenazaquin 200 SC (2X) @ 1250 ml (2.15/6 cm^2). Next, fenazaquin 200 SC @ 625 ml/l and fenazaquin 200 SC @ 500 ml/l, which recorded 3.85 and 4.21 mites/6 cm^2, respectively. An analogous pattern was noticed at 7 DAS.

The effectiveness of fenazaquin 200 SC @ 1250 ml/ha and Fenazaquin 200 SC @ 800 ml/ha was demonstrated at 14 days after spraying (DAS) by the least number of mites recorded (3.43 & 3.71/6 cm^2). This result was equivalent to the standard check spiromesifen 22.90% SC @ 400 m/ha with a mite count of 3.71/4 cm^2. The next best treatments, with mite populations of 4.70 and 5.06/6 cm^2, respectively, were fenazaquin 200 SC at 625 ml/ha and fenazaquin 200 SC at 500 ml/ha. Fenazaquin 200 SC @ 625 ml/ha was proven to be effective at 3, 7 and 14 days after spraying at significantly lower dosages, despite the greater dosage given cent percent control.

II Spray

Fenazaquin 200 SC @ 800 ml/ha on the third day following the second spray was statistically comparable to spiromesifen 22.90% SC and fenazaquin 200 SC @ 1250 ml/ha 5.66, 5.65, and 5.38 mites/6 cm^2, then fenazaquin 200 SC @ 625 ml/ha and fenazaquin 200 SC @ 500 ml/ha were significantly better than the control. The effectiveness of several treatments showed a similar trend at 7 DAS.

Fenazaquin 200 SC @ 625 ml/ha, 800 ml/ha, and 1250 ml/ha reported highest mite mortality at 14 DAS, followed by Fenazaquin 200 SC @ 500 ml/ha (0.56/6 cm^2). Fenazaquin 10 EC @ 1250 ml/ha and spiromesifen 22.90% SC @ 400 ml/ha were the next best treatments in terms of domination, with mite counts of 1.56 and 2.15 /6 cm^2, respectively. Fenazaquin belongs to the quinazoline class of chemicals and is a pesticide intended to manage mites and insects, it inhibits the mitochondrial electron transport chain and has been used against different stages of spider mites (Sangeetha and Ramaraju, 2013). The results were in line with, Longhurst *et al*. (1992) reported fenazaquin a novel acaricide for the management of spider mites in variety of crops. Senapati *et al.* (2010) reported that fenazaquin gave best control of yellow mite up to 14 days in chilli. The higher efficacy of these acaricides in our study were also supported by observations of Srinivas Reddy and Latha (2016); Sahoo *et al.* (2003) that fenazaquin was second to abamectin in terms of toxicity to adult females of red spider mite, *Oligonychus coffeae* infesting tea. Similarly, Bhardwaj and Sharma (2010) found that out of seven acaricides evaluated against two spotted spider mite, abamectin @ 0.01%, fenazaquin @ 0.001%, hexythiazox @ 0.0025% and propargite @ 0.05% provided excellent control in apple. Fenazaquin was found to be the most effective molecule which recorded 100 per cent mortality of gravid females at 24h after treatment application (Aswin *et al.,* 2015).

Yield:

The fruits were harvested starting at day 70, with a total of five pickings completed. At each picking, fruits were gathered according to treatment, and the total fruit yield was computed and shown in Table 3.

Based on data from two growing seasons, *Kharif* 2021 and *Kharif* 2022, fenazaquin 200 SC @ 1250 ml/ha produced the highest fruit output (18.07 tons/ha and 18.53 tons/ha, respectively) and was determined to be significantly better than alternative treatments. Fenazaquin 200 SC @ 800 ml/ha (17.85 and 18.00 tons/ha, respectively) and fenazaquin 200 SC @ 625 ml/ha (17 and 17.46 tonnes, respectively) were the next best treatments. In contrast, during 2021, spiromesifen 22.90% SC @ 400 ml/ha, fenazaquin 200 SC @ 500 ml/ha, and fenazaquin 10 EC @ 1250 ml/ha all recorded superior yields over control, with respect to fruit yields of 16.45, 16.27, and 16.20 tons/ha. During *Kharif* 2022, a similar trend was noted, with fruit yields of 16.71, 16.56, and 16.48 tons/ha.Higher fruit yield in comparison to the control treatment was demonstrated by the yield increase percentage over the control in both seasons.

Conclusion

The two spotted spider mite population in the tomato eco system was shown to be effectively reduced by applying fenazaquin 200 SC @ 625 ml/ha, which also increased fruit output. Even though fenazaquin 200 SC at 800 and 1250 ml/ha at higher dosages produced good outcomes, lower dosages that still produced results can be taken into consideration for use in the future.

Table 1 : Effect of Fenazaquin 200 SC against two spotted spider mite, *Tetranychus spp* on tomato during *Kharif* -2021

Treatments		Dose (g.ai/ ha)	Formulation (ml/ha)	*Tetranychus spp* (No./6 cm^2)						
				I spray				II spray		
				Before	3 DAS**	7 DAS	14 DAS	3 DAS	7 DAS	14 DAS
T1	Fenazaquin 200 SC	91.50	500	18.00* (4.30)	4.10^{c} (2.25)	2.13^{b} (1.77)	4.67^{b} (2.36)	5.00^{b} (2.33)	2.03^{b} (1.74)	0.50^{b} (0.99)
T2	Fenazaquin 200 SC (X)	114.37	625	18.66 (4.38)	3.70^{c} (2.16)	1.90^{c} (1.70)	2.67^{c} (1.76)	3.00^{c} (2.12)	1.85^{c} (1.66)	0.00^{b} (0.71)
T3	Fenazaquin 200 SC (1.25 X)	146.40	800	19.55 (4.48)	2.30^{d} (1.82)	1.27^{d} (1.50)	2.13^{d} (1.82)	2.20^{c} (1.75)	1.14^{d} (1.46)	0.00^{b} (0.71)
T4	Fenazaquin 10 EC	125	1250	19.00 (4.42)	5.20^{b} (2.49)	2.23^{b} (1.79)	3.17^{b} (2.00)	4.00^{b} (2.10)	2.10^{b} (1.76)	1.50^{c} (1.46)
T5	Spiromesifen 22.90% SC	96	400	18.13 (4.32)	2.30^{d} (1.82)	1.30^{d} (1.51)	2.33^{c} (1.77)	4.25^{b} (2.35)	1.20^{d} (1.48)	2.00^{c} (1.56)
T6	Fenazaquin 200 SC (2X)	228.75	1250	18.20 (4.32)	2.11^{d} (1.72)	1.00^{d} (1.11)	1.33^{d} (1.29)	1.00^{d} (1.16)	0.75^{d} (1.00)	0.00^{b} (0.71)
T7	Untreated control	-	-	18.00 (4.30)	18.80^{a} (3.65)	19.30^{a} (2.46)	20.00^{a} (3.71)	15.00^{a} (4.13)	11.08^{a} (3.32)	10.00^{a} (3.26)
S.Em.±				NS	0.05	0.12	0.18	0.05	0.09	0.07
CD @ 5%					0.16	0.38	0.56	0.15	0.29	0.23
CV%					5.86	8.77	11.67	5.78	10.05	5.34

Days after spray
*Top 3 leaves from 10 randomly selected plants (In 2 sq cm area in each leaf)
Figures in the parenthesis are √x+0.5 transformed values
In a column means followed by same letter(s) are not significantly different by DMRT (P= 0.05)

Table 2 : Effect of Fenazaquin 200 SC against two spotted spider mite, *Tetranychus spp* on tomato during *Kharif* -2022

Treatments		Dose (g.ai/ ha)	Formulation (ml/ha)	*Tetranychus spp* (No./6 cm^2)						
				I spray				II spray		
				Before	3 DAS**	7 DAS	14 DAS	3 DAS	7 DAS	14 DAS
T1	Fenazaquin 200 SC	91.50	500	17.25 (4.18)	4.21^{c} (2.05)	2.65^{b} (1.62)	5.06^{b} (2.24)	7.01^{b} (2.64)	2.07^{c} (1.43)	0.56^{b} (1.03)
T2	Fenazaquin 200 SC (X)	114.37	625	16.98 (4.11)	3.85^{c} (1.96)	2.29^{b} (1.51)	4.70^{b} (2.16)	6.65^{b} (2.57)	1.90^{c} (1.37)	0.00^{a} (0.71)
T3	Fenazaquin 200 SC (1.25 X)	146.40	800	17.00 (4.12)	2.42^{b} (1.55)	1.30^{a} (1.14)	3.71^{a} (1.92)	5.66^{a} (2.37)	1.19^{b} (1.09)	0.00^{a} (0.71)
T4	Fenazaquin 10 EC	125	1250	17.50 (4.17)	5.34^{d} (2.31)	3.78^{c} (1.94)	6.19^{c} (2.48)	8.14^{c} (2.85)	2.14^{c} (1.46)	1.56^{c} (1.43)
T5	Spiromesifen 22.90% SC	96	400	18.00 (4.23)	2.44^{b} (1.56)	1.29^{a} (1.13)	3.71^{a} (1.92)	5.65^{a} (2.37)	1.23^{b} (1.10)	2.15^{d} (1.62)
T6	Fenazaquin 200 SC (2X)	228.75	1250	16.50 (4.06)	2.15^{a} (1.46)	1.02^{a} (1.01)	3.43^{a} (1.85)	5.38^{a} (2.31)	0.81^{a} (0.99)	0.00^{a} (0.71)
T7	Untreated control	-	-	17.76 (4.21)	18.21^{e} (4.26)	19.5^{d} (4.41)	21.91^{d} (4.68)	17.24^{d} (4.15)	14.29^{d} (3.77)	10.21^{e} (3.27)
S.Em.±				0.08	0.03	0.05	0.04	0.06	0.06	0.01
CD @ 5%				NS	0.09	0.17	0.14	0.18	0.18	0.15
CV%				8.29	9.57	11.26	8.29	11.72	11.97	9.98

**DAS: Days after spray
*Top 3 leaves from 10 randomly selected plants (In 2 sq cm area in each leaf)
Figures in the parenthesis are √x+0.5 transformed values
In a column means followed by same letter(s) are not significantly different by DMRT (P= 0.05)

Table 3 : Effect of Fenazaquin 200 SC on tomato fruit yield during Kharif -2021 and *Kharif* 2022

Treatments		Dose (g.ai/ ha	Formulation (ml/ha)	*Kharif* 2021		*Kharif* 2022	
				Fruit yield (Ton/ha)	% Increase over control	Fruit yield (Ton/ha)	% Increase over control
T1	Fenazaquin 200 SC	91.50	500	16.27	301.67	16.56	339.00
T2	Fenazaquin 200 SC (X)	114.37	625	17.00	375.00	17.46	384.00
T3	Fenazaquin 200 SC (1.25 X)	146.40	800	17.85	460.00	18.00	437.00
T4	Fenazaquin 10 EC	125	1250	16.20	295.00	16.48	314.00
T5	Spiromesifen 22.90% SC	96	400	16.45	320.00	16.71	350.00
T6	Fenazaquin 200 SC (2X)	228.75	1250	18.07	482.00	18.53	509.00
T7	Untreated Check	-	-	13.25	0	14.15	0
SE.m.±				0.68		0.54	
CD @ 5%				2.09		1.57	
CV%				13.40		12.93	
ESS				66.14		64.25	

References

Ao, M. A. (2014). Seasonal incidence of insect-pests in tomato (*Lycopersicon esculantum* M.) on different planting dates and its correlation with abiotic factors. *IJBSM*, *5*, 280-284.

Ashwini, A., Hegde, M, G., Biradar, M, S., Ravikumar Hosamani and Gurupad Balol. (2023). Efficacy of newer molecules against red spider mite, *Tetranychus urticae* in tomato under protected cultivation. *J. Pharm. Innov* 2023; **12**(3): 5724-5727

Aswin, T., Bhaskar, H., and Subramanian, M. (2015). Efficacy of novel acaricide molecules and botanicals against rice leaf mite *Oligonychus oryzae* (Hirst) (Prostigmata: Tetranychidae). *Trop. Agric.*, ***53***(2), 187-190.

Bharadwaj, S. and Sharma, S. (2010). Response of two spotted mite, *Tetranychus urticae* Koch. (Fam : Tetranychidae) to new acaricides in apple orchards of Himachal Pradesh. Abstract of International Symposium-cum-Workshop in Acarology. pp. 81-83.

Herrmann, I., Berenstein, M., Paz-Kagan, T., Sade, A., and Karnieli, A. (2017). Spectral assessment of two-spotted spider mite damage levels in the leaves of greenhouse-grown pepper and bean. *Biosyst. Eng.*, ***157***, 72-85.

Longhurst, C., Bacci, L., Buendia, J., Hatton, C. J., Petitprez, J., and Tsakonas, P. (1992). Fenazaquin, a novel acaricide for the management of spider mites in a variety of crops. Proceedings of The Brighton Crop Protection Conference, Pest and Diseases, Brighton **23**: 51–8.

Mondal, B., Mondal, P., Das, A., and Bhattyacharyya, K. (2019). Seasonal incidence of different insect pests of tomato (*Lycopersicon esculentum* Mill.) and their correlation with abiotic factor in lateritic zone of West Bengal. *J. Entomol. Zool. Stud*, ***7***(1), 1426-1430.

Mota-Sanchez, D. and Wise, J. C. (2021). The arthropod pesticide resistance database. *Michigan State University*.

Naveena, K., Shanthi, M., Chinniah, C., Jayaraj, J., Ramasubramanian, T., Mini, M. L., and Renuka, R. (2023). Acaricide resistance in field-collected two-spotted spider mite *Tetranychus urticae* Koch. *Indian J. Entomol*, 354-358.

Rapucel, T.Q., Roberto, A., Salvador, O., Heriberto, M., Agustín, H., Julio, C. C. (2021). 'Bioacaricidal Potential of *Moringa oleifera* Ethanol Extract for Tetranychus merganser Boudreaux (Acari: Tetranychidae) Control', *Plant. J.,* **10**, 10 -34.

Sahoo, B., Sahoo, S. K., and Somchaudhury, A. K. (2003, November). Studies on the toxicity of newer molecules against tea red spider mite. In *Proceedings of the National Symposium on Frontier Areas of Entomological Research* (pp. 301-2).

Sangeetha, S., and Ramaraju, K. (2013). Relative toxicity of fenazaquin against two-spotted spider mite on okra. *Int. J. Veg. Sci*, ***19***(3), 282-293.

Shukla, A., Radadia, G. G., and Hadiya, G. D. (2017). Estimation of loss due to two spotted spider mite, *Tetranychus urticae* Koch (Acari: Tetranychidae) infesting brinjal. *IJCMAS*, ***6***(9), 2145-2150.

Srinivas Reddy, D and Latha, M. P. (2016). Novel acaricide toxicities on *Tetranychus urticae* infesting Piper beetle. *Indian J. Agric. Sci*, ***86***(4), 506-11.