Original Research Article

Efficacy of Fluopyram 250 g/L + Trifloxystrobin 250 g/L SC against anthracnose disease of pomegranate

ABSTRACT

The experiment was conducted at Horticultural Instructional Farm, C. P. College of Agriculture, S. D. Agricultural University, Sardarkrushinagar during *Kharif*-2022 &*Kharif*-2023, respectively to evaluate the bio-efficacyFluopyram 250 g/L+ Trifloxystrobin 250 g/L SCagainst field as well as post-harvest disease of anthracnose in pomegranate.For the field disease, the disease severity (percent) of anthracnose leaf and fruit spot were recorded separately, before spraying and at 5 and 10 days after each spray. Disease assessment was done using standard rating scale. To measure the post-harvest anthracnose disease after harvest, 20 healthy pomegranate fruits per replication per treatment were kept at ambient temperature for 30 days. More so ever the observation on phytotoxicity and yield were also recorded. The result revealed that treatments Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 80 ml per 100 lit. of water and Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 70 ml per 100 lit. of water showed significantly higher efficacy against field diseases of anthracnose in terms of leaf and fruit spot and against post-harvest anthracnose disease of pomegranate and also given highest fruit yield as well as recorded lowest fruit weight reduction after 30 days of harvesting during *Kharif* 2021-22 and *Kharif* 2022-23, respectively followed by Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 60 ml per 100 lit. of water and Propineb 70% WP @ 300 gm per 100 lit. of water. The two years data on the phytotoxicity studies revealed that none of the treatments exhibited any of the phytotoxicity symptoms.

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Keyword: Pomegranate, *Punica granatum* L.,*Anthracnose, Colletotrichum gloeosporioides, Post harvest*

1. INTRODUCTION

The pomegranate (*Punica granatum* L.) is a fruit-bearing deciduous shrub in the Lythraceae family, subfamily Punicoideae. It has a long history in India and has become an important horticultural crop due to its adaptability to various climatic conditions, particularly in arid and semi-arid regions, nutritional benefits, and economic value. Pomegranate production is becoming more popular in India because to its high demand, hardiness, cheap maintenance cost, high yield, improved storage quality, and medicinal properties. The Indian Herbal System states that all components of the pomegranate, including the roots, leaves, blossoms, rind, seeds, and reddishbrown bark, are utilized medicinally. Pomegranate bark and root contain numerous alkaloids, including isopelletierine, which is effective against tapeworms. A single pomegranate (weighing 282 g) contains 234 calories, 4.7 g of protein, 52.7 g of carbohydrates, and 3.3 g of fat. Pomegranate seeds, also known as arils, are an excellent source of fiber and are abundant in potassium, phosphorus, magnesium, and calcium (Bhowmik, 2013). Iran, India, China, Turkey, and the United States are significant producing countries, accounting for around 76% of global output. In 2021-22, India produced around 3.21 million metric tons (MMT) of pomegranates, which is about 3% of the world's total fruit production of 107.10 MMT. India ranks seventh in the world for pomegranate production, and the total area under cultivation is around 275,500 hectares. Maharashtra is the leading producer of pomegranates in India, accounting for about 54.85% of the total area and 66% of total production (1,763.99

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thousand tonnes). In 2021-22, Gujarat produced 684.32 thousand tonnes with a 21.28% of total production of pomegranates in India (National Horticultural Board, 2022).

Comment [BU4]: Are all the figures reported by National Horticultural Board, 2022? If not, it is better to add source of these figures

Pomegranate farming is facing challenges due to water scarcity, unpredictable weather patterns, and outbreaks of insect pests and diseases. Among these, leaf and fruit spot/rot diseases are significant issues observed in orchards during consistently high moisture levels. Anthracnose, caused by *Colletotrichum gloeosporioides* (Penz.) Penz. & Sacc., results in sunken brown spots appearing on leaves, flowers, and fruits, which can ultimately lead to rotting. Leaves that are infected may also become yellow and fall off. (Munhuweyi *et al*., 2016). So, looking to the problems of the farmers the experiment has been conducted to measure the efficacy of new novel fungicide Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC against anthracnose diseases of pomegranate in field as well as in post-harvest condition. The results will be helpful in advising farmers for managing those diseases through foliar application of this fungicide as scheduled or need based application and can be incorporated in IDM programme in pomegranate cultivation.

2. METHODOLOGY

The study was performed using a Randomized Block Design (RBD) at the Horticultural Instructional Farm, C. P. College of Agriculture, S. D. Agricultural University, Sardarkrushinagar, during the *Kharif* season of 2022 and 2023, focusing on the Bhagwa (Kesar) variety of pomegranate planted at a spacing of 4m × 4m to assess the bio-efficacy against anthracnose diseases and phyto-toxicity, along with the impact of Fluopyram 250 g/L + Trifloxystrobin 250 g/L SC on pomegranate yield. Four replications for each treatment with two trees per replication were taken into account for the observation. A total of two sprays for each treatment were administered, with the first occurring at the disease's onset (<1%) and a second spray applied after a 10-day interval, both as foliar applications. The overall quantity of water was 1000L/ha, applied using a knapsack sprayer equipped with a hollow cone nozzle.

The severity (percent) of anthracnose leaf and fruit spot was measured individually, prior to spraying (pre-treatment) and at 5 and 10 days following each spray (post-treatments). Disease evaluations for anthracnose were conducted utilizing the standard rating scale (0-6) established by ICAR-NRCP in 2006, assessing 5 branches per tree randomly. Ultimately, Percent Disease Intensity/ Index (PDI) (Mc Kinney, 1923) was computed. To observe post-harvest diseases after harvest, 20 healthy Pomegranate fruits for each replication per treatment were stored at room temperature for 30 days. The subsequent observations were noted. The reduction in fruit weight was determined during storage

(Fruit weight loss = fresh weight of fruits at harvest-weight of fruits at 20 and 30 days after harvest).

1. Fresh weight of Pomegranate fruits immediately after harvest.
2. Post-harvest disease severity / index was recorded at 10 days after harvest.
3. Post-harvest disease severity / index was recorded at 15 days after harvest.
4. Post-harvest disease severity / index was recorded at 20 days after harvest
5. Post-harvest disease severity / index was recorded at 25 days after harvest
6. Post-harvest disease severity / index was recorded at 30 days after harvest

Total pomegranate fruit yield from all pickings per plot were recorded and converted in to t/ha. Effects of Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC on pomegranate at 80 & 160 ml/ ha. were recorded at 1, 3, 5, 7, and 10 days after second spray, the observation for yellowing, stunting, necrosis, epinasty and hyponasty, etc. were measured based on 0-10 Phytotoxicity rating scale (0:No Phytotoxicity, 1:0-10, 2:11-20, 3:21-30, 4:31-40, 5:41-50, 6:51-60, 7:61-70, 8:71-80, 9:81-90, 10:91-100.).

Table 1: Disease rating Scales (0-6)

Disease score	Lesion area on leaves (%)	Lesion area on Fruit(%)
0	0.00	0.00
1	Up to 1	Up to 1
2	>1-10	>1-10
3	>10-20	>10-20
4	>20-40	>20-40
5	>40-70	>40-70
6	-	>70-100

Disease Intensity (%)= $\frac{\text{Sum of individual rating} \times 100}{\text{No. of plant branches examined} \times \text{Maximum disease scale}}$

Per cent Reduction Over Control (ROC)= $\frac{\text{Control Mean} - \text{Treatment Mean} \times 100}{\text{Control Mean}}$

Table 2: Treatment details

Tr. No.	Treatments	Dosage (per 100 lit. of water)	
		a.i. (gm)	Formulation (gm or ml)
T_1	Untreated Control	--	--
T_2	Fluopyram 250 g/L+ Trifloxystrobin 250 g/L SC	15+15	60 ml
T_3	Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC	17.5+17.5	70 ml
T_4	Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC	20+20	80 ml
T_5	Fluopyram 400 g/L SC	20	50 ml
T_6	Trifloxystrobin 50% WG	20	40 g
T_7	Propineb 70%WP	210	300 g
T_8	Kitazin 48% EC	100	200 ml

3. RESULTS AND DISCUSSION

3.1 Bio-efficacy of Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC against Anthracnose leaf spot during 2021

The data presented in table 3 revealed that there was significant difference observed among the treatments in terms of Anthracnose disease intensity on leaves over untreated control. Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 80 ml per 100 lit. of water recorded significantly lower mean disease intensity after first spray application (16.81%) and second spray application (17.70%), respectively which was found at par with Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 70 ml per 100 lit. of water with mean disease intensity of 17.61% and 18.65% at first and second spray application, respectively.Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 60 ml per 100 lit. of water treatment show mean disease intensity of 20.70% and 22.45% at first spray application and second spray application, respectively which was found at par with Propineb70%WP@ 300 gm per 100 lit. of water with mean disease intensity of 21.16% and 23.01% at first spray application and second spray application, respectively.Fluopyram 400 g/L SC@ 50ml per 100 lit. of water having mean disease intensity of 23.75% and 26.39%at first spray application and second spray application, respectively which was found at par with the treatment Trifloxystrobin 50% WG @ 40g per 100 lit. of water (23.75% and 26.39%) and Kitazin 48% EC @ 200 ml per 100 lit. of water(24.42% and 24.95%), respectively.Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 80 ml per 100 lit. of water observed highest percent of reduction over control after first spray application (77.48%) and second spray application (85.68%), respectively which was followed by Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 70 ml per 100 lit. of water recorded with 75.36% and 84.15% percent reduction over control after first and second spray application, respectively.

Comment [BU5]: The results and discussion part, is lacking the linkage between the obtained results and the existing literature. To support the results there is a need to add various the studies on efficacy of Fluopyram and Trifloxystrobin in managing anthracnose in other crops or fruits.
Again, It is better to incorporate the tables of the results within the text prior to their discussion rather than adding them as appendices.

3.2Bio-efficacy of Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC against Anthracnose leaf spot during 2022

The data presented in table 3 revealed that there was significant difference observed among the treatments in terms of Anthracnose disease intensity on leaves over untreated control. Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 80 ml per 100 lit. of water recorded significantly lower mean disease intensity after first spray application (16.84%) and second spray application (17.33%), respectively which was found at par with Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 70 ml per 100 lit. of water with mean disease intensity of 17.28% and 18.24% at first and second spray application, respectively.Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 60 ml per 100 lit. of water treatment show mean disease intensity of 20.75% and 22.10% at first spray application and second spray application, respectively which was found at par with Propineb70%WP@ 300 gm per 100 lit. of water with mean disease intensity of 21.30% and 22.83% at first spray application and second spray application, respectively.Fluopyram 400 g/L SC @ 50ml per 100 lit. of water having mean disease intensity of 23.82% and 25.99%at first spray application and second spray application, respectively which was found at par with the treatment Trifloxystrobin 50% WG @ 40g per 100 lit. of water (23.93% and 26.27%) and Kitazin 48% EC @ 200 ml per 100 lit. of water(24.57% and 26.73%), respectively.Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 80 ml per 100 lit. of water observed highest percent of reduction over control after first spray application (77.08%) and second spray application (86.12%), respectively which was followed by Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 70 ml per 100 lit. of water recorded with 75.81% and 84.68% percent reduction over control after first and second spray application, respectively.

3.3 **Bio-efficacy of Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC against Anthracnose fruit spot during 2021**

The data presented in table 4 revealed that there was significant difference observed among the treatments in terms of Anthracnose disease intensity on fruits over untreated control. Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 80 ml per 100 lit. of water recorded significantly lower mean disease intensity after first spray application (17.12%) and second spray application (17.84%), respectively which was found at par with Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 70 ml per 100 lit. of water with mean disease intensity of 17.91% and 18.76% at first and second spray application, respectively.Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 60 ml per 100 lit. of water treatment show mean disease intensity of 20.86% and 20.93 % at first spray application and second spray application, respectively which was found at par with Propineb70%WP@ 300 gm per 100 lit. of water with mean disease intensity of 21.16% and 23.97% at first spray application and second spray application, respectively.Fluopyram 400 g/L SC @ 50ml per 100 lit. of water having mean disease intensity of 23.40% and 25.00%at first spray application and second spray application, respectively which was found at par with the treatment Trifloxystrobin 50% WG @ 40g per 100 lit. of water (23.62% and 24.97%) and Kitazin 48% EC @ 200 ml per 100 lit. of water(24.38% and 25.92%), respectively.Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 80 ml per 100 lit. of water observed highest percent of reduction over control after first spray application (75.24%) and second spray application (85.22%), respectively which was followed by Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 70 ml per 100 lit. of water recorded with 72.87% and 83.72% percent reduction over control after first and second spray application, respectively.

3.4Bio-efficacy of Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC against Anthracnose fruit spot during 2022

The data presented in table 4 revealed that there was significant difference observed among the treatments in terms of Anthracnose disease intensity on fruits over untreated control. Fluopyram 250 g/L

+Trifloxystrobin 250 g/L SC @ 80 ml per 100 lit. of water recorded significantly lower mean disease intensity after first spray application (17.35%) and second spray application (17.81%), respectively which was found at par with Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 70 ml per 100 lit. of water with mean disease intensity of 18.02% and 18.72% at first and second spray application, respectively.Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 60 ml per 100 lit. of water treatment show mean disease intensity of 21.16% and 22.50 % at first spray application and second spray application, respectively which was found at par with Propineb70%WP@ 300 gm per 100 lit. of water with mean disease intensity of 22.04% and 23.20% at first spray application and second spray application, respectively.Fluopyram 400 g/L SC @ 50ml per 100 lit. of water having mean disease intensity of 24.32% and 26.31%at first spray application and second spray application, respectively which was found at par with the treatment Trifloxystrobin 50% WG @ 40g per 100 lit. of water (24.59% and 26.47%) and Kitazin 48% EC @ 200 ml per 100 lit. of water(25.53% and 27.25%), respectively.Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 80 ml per 100 lit. of water observed highest percent of reduction over control after first spray application (75.20%) and second spray application (85.38%), respectively which was followed by Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 70 ml per 100 lit. of water recorded with 73.22% and 83.92% percent reduction over control after first and second spray application, respectively.

3.5 Bio-efficacy of Fluopyram 250 g/L +Trifloxystrobin 250 g/L SCagainst Post Harvest Anthracnose fruit spot during 2021

The data presented in table 5 revealed that there was significant difference observed among the treatments in terms of post-harvest anthracnose disease intensity measured during 10, 15, 20, 25 and 30 days after harvesting offruits over untreated control. Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 80 ml per 100 lit. of water recorded 84.40 % reduction over control recorded at 30 days after harvesting of fruit spot of anthracnose, followed by Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 70 ml per 100 lit. of water with 83.12 %.

3.6 Bio-efficacy of Fluopyram 250 g/L +Trifloxystrobin 250 g/L SCagainst Post Harvest Anthracnose fruit spot during 2022

The data presented in table 6 revealed that there was significant difference observed among the treatments in terms of post-harvest anthracnose disease intensity measured during 10, 15, 20, 25 and 30 days after harvesting of fruits over untreated control. Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 80 ml per 100 lit. of water recorded 82.36 % reduction over control recorded at 30 days after harvesting of fruit spot of anthracnose, followed by Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 70 ml per 100 lit. of water with 81.00 %.

3.7 Bio-efficacy of Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC against post-harvest anthracnose fruit weight reduction during 2020-21 and 2021-22

The data presented in table 7&8 revealed that Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 80 ml per 100 lit. of water recorded highest fruit weight after 30 days of fruit harvesting (243.87 and 232.45 gm) followed by Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 70 ml per 100 lit. of water (217.34 and 227.00 gm) during two consecutive year, respectively.

3.8 Effect of Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC on pomegranate fruit yield during 2020-21 & 2021-22

The data presented in table 9 revealed that Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 80 ml per 100 lit. of water recorded highest yield of pomegranate 20.24 and 21.65 ton/ha followed by Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 70 ml per 100 lit. of water with a 18.54 and 18.79 ton/ha during 2021 and 2022, respectively.

3.9 Effect of Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC on Phytotoxicity during 2020-21 & 2021-22

The two years data on the phytotoxicity studies of Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC revealed that none of the treatments exhibited any of the phytotoxicity symptoms, for yellowing, stunting, necrosis, epinasty, hyponasty *etc*. were recorded based on 0-10 Phytotoxicity rating scale (PRS) scale.

Fluopyram, a pyridylethylamide broad spectrum fungicide, is being developed for protection against arange of Ascomycete and Deuteromycete diseases in many horticultural and arable crops. Fungicidalaction is by the inhibition of succinate dehydrogenase (complex II) within the fungal mitochondrialrespiratory chain, thus blocking electron transport. Fluopyram inhibits spore germination, germ tubeelongation, mycelium growth and sporulation. Within plants, fluopyram shows translaminar activityand some movement within the xylem. Trifloxystrobin is a broad spectrum fungicide that binds to the cytochrome b's Qo site, which blocks the electron transport between cytochrome b and cytochrome c1 this disrupts the energy cycle in the fungi. Ravikumar *et. al.* (2020) evaluates the pre-mix fungicide, Fluopyram and Trifloxystrobin 250SC against purple blotch disease of onion and they found that Fluopyram250SC and Trifloxystrobin 250SC @ 600 ml / ha proved to be best for management of purple blotch 22.03% diseases index (PDI), which was superior over all other treatments with maximum bulb yield of 24.77 t/ha.

Fluopyram 250g/L+ Trifloxystrobin 250g/L can be used for the control of angular leaf spot and bean rust could be potential to provide farmers with more choice hence avoid pathogen resistances and resurgence (Mpina and Mkalanga., 2016). According to Chakraborty (2021) anthracnose and powdery mildew of chilli can be effectively controlled by application of mixture of Fluopyram 250G/L+ Trifloxystrobin 250G/L @ 300 g a.i. per ha.

4. CONCLUSION:

The treatments Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 80 ml per 100 lit. of water and Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 70 ml per 100 lit. of water showed significantly higher efficacy against field as well as post-harvest diseases of anthracnose in pomegranate in terms of leaf and fruit spot, respectively and given highest fruit yield as well as recorded lowest fruit weight reduction after 30 days of harvesting during *Kharif* 2021-22 and *Kharif* 2022-23, respectively followed by Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC @ 60 ml per 100 lit. of water and Propineb 70% WP @ 300 gm per 100 lit. of water. The two years data on the phytotoxicity studies revealed that none of the treatments exhibited any of the phytotoxicity symptoms on pomegranate.

Comment [BU6]: In conclusion add the recommendation on whether this fungicide can be used as predefined or as needed based on the findings as it is one of the aims mentioned in the introduction session

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declares that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

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Table 3: Bio-efficacy of Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC against Anthracnose leaf spot during *Kharif* 2021 and *Kharif* 2022

Tr. No	Treatments	Dosage /100 litre of water		Before spray	2021 PDI Mean	% ROC	2022 PDI Mean	% ROC
		g a.i	Formulation					
T_1	Untreated Control	--	--	17.56 (9.10)	53,74 (64.89)	00.00	53.39 (64.30)	00.00
T_2	Fluopyram 250 g/L+Trifloxystrobin 250 g/L SC	15+15	60 ml	17.13 (8.68)	22.45 (14.62)	77.46	22.10 (14.19)	77.93
T_3	Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC	17.5+17.5	70 ml	16.33 (7.90)	18.65 (10.28)	84.15	18.24 (9.85)	84.68
T_4	Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC	20+20	80 ml	16.86 (8.43)	17.70 (9.29)	85.68	17.33 (8.92)	86.12
T_5	Fluopyram 400 g/L SC	20	50 ml	17.64 (9.19)	26.16 (19.49)	69.96	25.99 (19.25)	70.06
T_6	Trifloxystrobin 50% WG	20	40 g	17.14 (8.79)	26.39 (19.84)	69.42	26.27 (19.67)	69.40
T_7	Propineb 70%WP	210	300 g	17.80 (9.35)	23.01 (15.36)	76.32	22.83 (15.13)	76.46
T_8	Kitazin 48% EC	100	200 ml	16.97 (8.53)	24.95 (20.72)	68.06	26.73 (20.43)	68.82
			S. Em. ±	0.78	0.85	-	0.87	-
			C. D. (P=0.05)	NS	2.51	-	2.58	-
			CV	8.88	7.69	-	9.47	-

Figures in parentheses are retransformed values; those outside are arc sin transformed value
NS: Non Significant, ROC: Reduction Over Control, PDI: Per cent Disease Incidence

Table 5: Bio-efficacy of Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC against Post Harvest Anthracnose fruit spot during *Kharif*2021

Tr. No	Treatments	Dosage /100 litre of water		Before spray	2021 PDI Mean	% ROC	2022 PDI Mean	% ROC
		g a.i	Formulation					
T_1	Untreated Control	--	--	17.82 (9.42)	53.21 (63.83)	00.00	53.54 (64.40)	00.00
T_2	Fluopyram 250 g/L+Trifloxystrobin 250 g/L SC	15+15	60 ml	17.01 (8.59)	20.93 (14.74)	76.90	22.51 (14.68)	77.20
T_3	Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC	17.5+17.5	70 ml	16.45 (8.10)	18.76 (10.39)	83.72	18.72 (10.35)	83.92
T_4	Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC	20+20	80 ml	16.68 (8.35)	17.84 (9.43)	85.22	17.82 (9.41)	85.38
T_5	Fluopyram 400 g/L SC	20	50 ml	17.35 (8.94)	25.00 (19.55)	69.37	26.31 (19.69)	74.08
T_6	Trifloxystrobin 50% WG	20	40 g	17.42 (9.05)	24.97 (19.95)	68.74	26.47 (19.92)	69.06
T_7	Propineb 70%WP	210	300 g	17.84 (8.99)	23.97 (15.54)	75.65	23.21 (15.56)	75.83
T_8	Kitazin 48% EC	100	200 ml	17.39 (8.95)	25.93 (20.76)	67.47	27.26 (21.07)	67.28
			S. Em. ±	0.75	1.16	-	1.15	-
			C. D. (P=0.05)	NS	3.46	-	3.39	-
			CV%	7.89	8.21	-	8.35	-

Figures in parentheses are retransformed values; those outside are arc sin transformed value
NS: Non Significant, ROC: Reduction Over Control, PDI: Per cent Disease Incidence

Table 6: Bio-efficacy of Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC against Post Harvest Anthracnose fruit spot during *Kharif*2022

Tr. No	Treatments	Dosage /100 liter of water		Post harvest disease PDI					% ROC
				Post harvest disease PDI					% ROC
Tr. No	Treatments			After 10	After 15	After 20	After 25	After 30	After 30 days
		g a.i	Formulation	After 10 days of harvesting	After 15 days of harvesting	After 20 days of harvesting	After 25 days of harvesting	After 30 days of harvesting	After 30 days of harvesting
T_1	Untreated Control	--	--	59.58 (74.22)	60.46 (75.58)	61.16 (76.51)	62.14 (77.74)	62.47 (78.15)	00.00
T_2	Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC	15+15	60 ml	23.26 (15.63)	23.63 (16.13)	23.75 (16.28)	24.73 (17.51)	25.07 (17.92)	77.06
T_3	Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC	17.5+17.5	70 ml	19.28 (10.93)	19.73 (11.43)	19.84 (11.55)	20.82 (12.78)	21.35 (13.19)	83.12
T_4	Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC	20+20	80 ml	18.25 (9.88)	18.73 (10.38)	18.88 (10.55)	18.86 (11.78)	19.19 (12.19)	84.40
T_5	Fluopyram 400 g/L SC	20	50 ml	27.00 (20.67)	27.35 (21.17)	27.50 (21.39)	28.48 (22.62)	28.81 (23.03)	70.53
T_6	Trifloxystrobin 50% WG	20	40 g	27.43 (21.34)	27.78 (21.84)	27.88 (22.00)	28.86 (23.23)	29.19 (23.64)	69.75
T_7	Propineb 70%WP	210	300 g	23.83 (16.42)	24.19 (16.92)	24.51 (17.36)	25.49 (18.59)	25.82 (19.00)	75.69
T_8	Kitazin 48% EC	100	200 ml	27.67 (21.77)	28.03 (22.27)	28.32 (22.73)	29.30 (23.96)	29.63 (24.37)	68.82
			S. Em. ±	0.96	0.90	0.98	0.94	0.95	-
			C. D. (P=0.05)	2.85	2.67	2.90	2.76	2.80	-
			CV	3.44	3.57	4.85	5.77	4.68	-

PDI: Per cent Disease Incidence, ROC: Reduction Over Control
Figures in parentheses are retransformed values; those outside are arc sin transformed value

Table 7: Bio-efficacy of Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC against Post Harvest fruit weight reduction during *Kharif* 2021									
Tr. No.	**Treatments**	**Formulation g a.i**	**Dosage /100 liter of water**	**1 days of harvesting**	**7 days of harvesting**	**14 days of harvesting**	**At time of harvesting**	**After 20 days of harvesting (g/m)**	**After 30 days of harvesting**
T_1	Untreated Control	--	--	59.76 (74.50)	60.44 (75.40)	61.05 (76.40)	62.47 (78.15)	63.87 (78.19)	00.00
T_2	Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC	15+15	60 ml	23.27 (15.63)	24.01 (16.63)	24.76 (17.63)	25.27 (17.92)	26.67 (19.42)	75.16
T_3	Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC	17.5+17.5	70 ml	19.38 (11.06)	20.19 (12.06)	21.03 (13.06)	21.64 (13.19)	22.02 (14.85)	81.00
T_4	Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC	20+20	80 ml	18.30 (9.93)	19.15 (10.93)	20.03 (12.00)	19.25 (12.19)	20.75 (13.79)	82.36
T_5	Fluopyram 400 g/L SC	20	50 ml	26.95 (20.61)	27.61 (21.61)	28.27 (22.59)	29.81 (23.03)	31.20 (24.38)	68.81
T_6	Trifloxystrobin 50% WG	20	40g	27.12 (20.85)	27.77 (21.85)	28.48 (22.85)	29.19 (23.64)	29.79 (24.64)	68.48
T_7	Propineb 70%WP	210	300g	23.75 (16.25)	24.48 (17.25)	25.22 (18.27)	25.27 (19.00)	26.67 (20.06)	74.34
T_8	Kitazin 48% EC	100	200ml	27.66 (21.66	28.37 (22.66)	28.95 (23.58)	29.78 (24.37)	31.10 (25.37)	67.55
			S. Em. ±	1.02	1.02	1.05	1.03	1.05	-
			C. D. (P=0.05)	3.04	3.03	3.10	3.05	3.02	-
			CV	4.44	3.48	5.70	4.70	3.80	

PDI: Per cent Disease Incidence, ROC: Reduction Over Control
Figures in parentheses are retransformed values; those outside are arc sin transformed value

Table 9: Effect of Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC on Pomegranate Fruit Yield during *Kharif*2021 &*Kharif*2022

		g a.i	Formulation	harvesting	harvesting fruit loss	harvesting fruit loss
T_1	Untreated Control	--	--	196.43	185.30	173.20
T_2	Fluopyram 250 g/L+Trifloxystrobin 250 g/L SC	15+15	60 ml	228.98	221.65	218.22
T_3	Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC	17.5+17.5	70 ml	239.50	232.36	217.34
T_4	Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC	20+20	80 ml	253.55	250.32	243.87
T_5	Fluopyram 400 g/L SC	20	50 ml	212.58	206.98	195.45
T_6	Trifloxystrobin 50% WG	20	40g	210.99	205.69	194.60
T_7	Propineb 70%WP	210	300g	207.58	203.65	191.54
T_8	Kitazin 48% EC	100	200ml	202.28	198..56	187.25

Table 8: Bio-efficacy of Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC against Post Harvest fruit weight reduction during *Kharif*2022

Tr. No	Treatments	Dosage /100 liter of water		Fruit weight (gm)		
		g a.i	Formulation	At time of harvesting	After 20 days of harvesting fruit loss	After 30 days of harvesting fruit loss
T_1	Untreated Control	--	--	186.30	172.46	167.34
T_2	Fluopyram 250 g/L+Trifloxystrobin 250 g/L SC	15+15	60 ml	226.75	218.32	214.30
T_3	Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC	17.5+17.5	70 ml	247.56	232.46	227.00
T_4	Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC	20+20	80 ml	245.55	234.22	232.45
T_5	Fluopyram 400 g/L SC	20	50 ml	210.58	202.41	198.43
T_6	Trifloxystrobin 50% WG	20	40g	212.70	203.65	195.87
T_7	Propineb 70%WP	210	300g	213.58	205.05	198.45
T_8	Kitazin 48% EC	100	200ml	204.22	196.58	192.09

Tr. No	Treatments	Dosage /100 liter of water		Pomegranate fruit Yield (t/ ha) 2021-22	Pomegranate fruit Yield (t/ ha) 2022-23
		g a.i	Formulation		
T_1	Untreated Control	--	--	12.95	13.20
T_2	Fluopyram 250 g/L+Trifloxystrobin 250 g/L SC	15+15	60 ml	17.14	17.39
T_3	Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC	17.5+17.5	70 ml	18.54	18.79
T_4	Fluopyram 250 g/L +Trifloxystrobin 250 g/L SC	20+20	80 ml	20.24	21.65
T_5	Fluopyram 400 g/L SC	20	50 ml	15.20	15.45
T_6	Trifloxystrobin 50% WG	20	40g	16.11	16.36
T_7	Propineb 70%WP	210	300g	17.03	17.28
T_8	Kitazin 48% EC	100	200ml	17.05	16.95
			S. Em. ±	0.30	0.40
			C. D. (P=0.05)	0.56	1.04
			CV	7.55	7.46