-IMPACT OF PROTECTIVE SPRAYS ON YIELD LOSS ASSESSMENT DUE TO PURPLE BLOTCH OF GARLIC CAUSED BY *ALTERNARIA PORRI*

ABSTRACT: Multiple treatments field experiment was conducted during *rabi* 2021-22 and 2022-23 on impact of protective sprays on yield loss assessment due to purple blotch of garlic involved combination of (azoxystrobin 11%+ tebuconazole 18% SC) applied at concentration of 0.15 %. Treatments with five sprays (T6), four sprays (T5) and three sprays (T4) showed considerable disease suppression, with AUDPC values of 1397.69, 1475.29 and 1543.83, respectively, translating to 61.86 per cent, 59.74 per cent and 57.82 per cent disease reduction over control. Plants treated with five sprays (T6) recorded highest plant height (40.98 cm), number of leaves per plant (7.59), cloves per bulb (20.10), clove weight (15.38 g), bulb weight (18.13 g), yield (73.68 q/ha), and yield increase (41.67%) over control followed by plants treated with four sprays (T5) ~~recorded~~ having the second highest plant height (40.69 cm), number of leaves per plant (7.41), cloves per bulb (19.14), clove weight (15.10 g), bulb weight (17.38 g), yield (72.07 q/ha), yield increase (38.57%) over control. Next best treatment was plants treated with three sprays (T4) recorded plant height (39.63 cm), number of leaves per plant (7.25), cloves per bulb (18.25), clove weight (13.75 g), bulb weight (16.25 g), yield (70.03 q/ha), yield increase (33.26%) over control.

Key Words: *AUDPC values, Garlic, Growth and yield parameters, protective sprays, Purple blotch*

INTRODUCTION

Garlic (*Allium sativum* L.) is an important ~~Spice~~ spice crop cultivated all over ~~the country~~India during *rabi* season except in Ooty hills of Tamil Nadu where it is grown during rainy season. India is the second ~~major~~ largest producer of Garlic having 2.01 lakh ha. area, 1058 lakh mt production and 5.27 t/ha productivity next after China. India exported 22665.99 mt. ~~Garlic~~ garlic amounting Rs. 3957.75 lakh during 2018-19 (Anon., 2025). It is widely used in flavouring of food, preparation of chutneys, pickles, curry powder, tomato ketch-up ~~etc~~and other dishes. Besides nutritive value~~s~~, it is included in Indian system of medicines (Ayurvedic, Unani and Siddha) as a carminative and gastric stimulant to help digestion and absorption of food (Sankaracharya, 1974). It is rich source of carbohydrates, proteins, phosphorus and volatile oil. Garlic crop is affected by various

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diseases of which, purple blotch caused by *Alternaria porri* (Ellis) Cif. is a major constraint and causes severe yield loss (Mishra *et al*., 2009). The ~~purple blotch called~~disease is also known by other names like Alternaria blight, Alternaria blotch and purple leaf spot (reference). Complete damage to the leaf tissues is observed at the time of bulb maturity (reference). Since the leaves are the only photosynthetic organ, this foliar pathogen directly influences the bulb yield (reference). Significant reduction in bulb yield (25-60 %) due to drying of leaves has been observed in garlic (Bisht and Agarwal, 1993). In earlier studies, Pramodkumar and Palakshappa (2008), Aktari (2013), Gupta *et al*. (2014) and Abd El-Kader *et al*.(2015) ~~were~~ conducted and assessment on the impact of protective sprays on yield loss ~~assessment~~ due to purple blotch of onion and garlic. Hence, in the present studies, multiple treatments field experiment was conducted during *rabi* 2021-22 and 2022-23 ~~on~~ to evaluated the impact of protective sprays on yield loss ~~assessment~~ due to purple blotch of garlic involved combination of (azoxystrobin 11%+ tebuconazole 18% SC) applied at concentration of 0.15 per cent.

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MATERIALS AND METHODS

a. Studies on the yield loss of garlic due to purple blotch.

Multiple treatments were applied in the experiment to study the variation in the disease severity of the purple blotch of garlic. The experiment was laid out in a Randomized Complete Block Design with four replications per treatment during *rabi* 2021-22 and *rabi* 2022-23 at College of Horticulture, Bidar, Karnataka. Cloves of Rajalli gadde garlic cultivar were planted with 15 cm X 10 cm (row to row X plant to plant) spacing in plot size of 3.6 m X 1.8 m and all the recommended agronomic practices were followed to raise a good crop (Anon, 2017).The first spray was initiated at 60 days after planting and subsequent spraying of fungicide was taken at an interval of 15 days. Altogether six treatments were applied comprising different number of sprays as follows.

T1: Untreated Control

T2: One spray with (azoxystrobin 11 % + tebuconazole 18 % SC) at 0.15 %

T3: Two sprays with (azoxystrobin 11 % + tebuconazole 18 % SC) at 0.15 %

T4: Three sprays with (azoxystrobin 11 % + tebuconazole 18 % SC) at 0.15 %

T5: Four sprays with (azoxystrobin 11 % + tebuconazole 18 % SC) at 0.15 %

T6: Five sprays with (azoxystrobin 11 % + tebuconazole 18 % SC) at 0.15 %

b. Monitoring of disease severity

The crop was observed for purple blotch disease at seven days intervals commencing from 60 days after planting. Five plants from each plot were randomly chosen in both seasons and data were collected on disease severity and calculated in terms of Percent Disease Incidence (PDI) by using the formula proposed by Wheeler (1969).

$$\text{Per cent disease index (PDI)} = \frac{\text{Sum of the individual disease ratings} \times 100}{\text{Number of leaves/plants observed x Maximum disease grade}}$$

The 0 to 5 point scoring scale (Sharma, 1986) was used to estimate the disease severity (PDI-Per cent Disease Index) of purple blotch of leaves for each unit plot under each treatment. After 90 days from the planting date, number of leaves/plant, plant height (cm) were recorded. At the time of harvest, yield parameters *viz.*, number of cloves/bulb, clove weight (g), bulb weight (g), total yield (q/ ha) were recorded. The obtained data were subjected to statistical analysis. The treatment means were compared using the Duncan Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

a. Studies on yield loss of garlic due to purple blotch.

Field experiment was conducted during *rabi* 2021-22 and 2022-23 to estimate the yield loss due to purple blotch of garlic. The spraying of (azoxystrobin 11 % + tebuconazole 18 % SC) was taken up immediately after appearance of the disease as described in "Material and methods" and the results presented. The study aimed to evaluate the effectiveness of different spray treatments in controlling *Alternaria porri* and mitigating the purple blotch disease in garlic during the *rabi* season of 2021-22 and 2022-23. The treatments involved a combination of (azoxystrobin 11%+ tebuconazole 18% SC) applied at a concentration of 0.15 per cent.

b. Studies on yield loss of garlic due to purple blotch during *rabi* 2021-22.

The results, as indicated by the AUDPC (Area Under Disease Progress Curve) values and corresponding per cent disease reduction over the untreated control (T1), show a clear trend in disease reduction with increasing spray frequency. The ~~Area~~ area under disease progressive curve values in differentially sprayed garlic plots ranged from 1392.88 to 2011.40, while it was 3655.62 in untreated control (T1). Area under disease progressive curve values was significantly high in plots applied with only one spray (2011.40) of fungicide when compared to rest of the treatments. Similarly, AUDPC values of plots spraying two (1545.85), three(1497.60), four (1478.03), five(1392.88), respectively (Table 1 and Figure 1). Per cent disease reduction over control was reduced to an extent of 59.03, 59.57 and 61.89 per cent when sprayed three, four and five times respectively, while it was 44.98 and 57.71 per cent with one and two sprays respectively. Plants treated with five sprays (T6) recorded the highest plant height (41.03 cm), number of leaves per plant (7.58), cloves per bulb (19.90), clove weight (15.12 g), bulb weight (18.10 g), yield (73.52 q/ha), yield increase (39.91%) over control and benefit-cost ratio (B:C ratio = 3.57) followed by plants treated with four sprays (T5) recorded plant height (40.83 cm), number of leaves per plant (7.38), cloves per bulb (19.12), clove weight (14.50 g), bulb weight (17.25 g), yield (72.09 q/ha), yield increase (37.18%) over control and benefit-cost ratio (B:C ratio = 3.54) (Table 2 and Figure 2). Next best treatment was plants treated with three sprays (T4) recorded plant height (39.63 cm), number of leaves per plant (7.25), cloves per bulb (18.25), clove weight (13.75 g), bulb weight (16.25 g), yield (70.03 q/ha), yield increase (33.26%) over control and benefit-cost ratio (B:C ratio = 3.48). However, untreated control plants recorded lowest plant height (35.03 cm), number of leaves per plant (6.18), cloves per bulb (11.80), clove weight (8.75 g), bulb weight (10.50 g), yield (52.55 q/ha) and benefit-cost ratio (B:C ratio = 2.70).

c. Studies on yield loss of garlic due to purple blotch during *rabi* 2022-23.

The assessment of Area Under Disease Progress Curve (AUDPC) values and per cent disease reduction over the untreated control was conducted during the *rabi* season of 2022–23. The data reveals a significant reduction in disease progression with increased frequency of fungicide application, indicating the effectiveness of this combination in managing the disease. The results, as indicated by the AUDPC (Area Under Disease Progress Curve) values and corresponding per cent disease reduction over the untreated control (T1),

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show a clear trend in disease reduction with increasing spray frequency. The Area under disease progressive curve values in differentially sprayed garlic plots ranged from 1383.04 to 1977.62, while it was 3642.50 in untreated control (T1). Treatments with five sprays (T6), four sprays (T5) and three sprays (T4) also showed considerable disease suppression, with AUDPC values of 1383.04, 1473.61 and 1547.36, respectively, translating to 62.03 per cent, 59.54 per cent and 57.52 per cent disease reduction over control (Table 3 and Figure 3). Similarly, two sprays (T3) led to an AUDPC value of 1662.16 and 54.37 per cent disease reduction, while one spray (T2) was least effective among the treatments, with an AUDPC of 1977.62 and a 45.71 per cent disease reduction. Plants treated with five sprays (T6) recorded the highest plant height (40.93 cm), number of leaves per plant (7.60), cloves per bulb (20.30), clove weight (15.75 g), bulb weight (18.25 g), yield (73.83 q/ha), yield increase (43.44%) over control and benefit-cost ratio (3.28) followed by plants treated with four sprays (T5) recorded plant height (40.55 cm), number of leaves per plant (7.45), cloves per bulb (19.15), clove weight (15.50 g), bulb weight (17.50 g), yield (72.05 q/ha), yield increase (39.98%) over control and benefit-cost ratio (3.23) (Table 4 and Figure 4). Next best treatment was plants treated with three sprays (T4) recorded plant height (40.10 cm), number of leaves per plant (7.38), cloves per bulb (18.20), clove weight (13.50 g), bulb weight (17.04 g), yield (70.51 q/ha), yield increase (36.99%) over control and benefit-cost ratio (3.20). However, untreated control plants recorded lowest plant height (34.00 cm), number of leaves per plant (6.05), cloves per bulb (12.13), clove weight (9.10 g), bulb weight (11.12 g), yield (51.47 q/ha) and benefit-cost ratio (2.42).

d. Studies on Pooled yield loss of garlic due to purple blotch during *rabi* 2021-22 and 2022-23

The pooled analysis of AUDPC values of all treatments over two seasons followed a similar pattern as observed in individual seasons. The Area under disease progressive curve values in differentially sprayed garlic plots ranged from 1397.69 to 2011.88, while it was 3664.43 in untreated control (T1). Treatments with five sprays (T6), four sprays (T5) and three sprays (T4) also showed considerable disease suppression, with AUDPC values of 1397.69, 1475.29 and 1543.83, respectively, translating to 61.86 per cent, 59.74 per cent and 57.82 per cent disease reduction over control(Table 5 and Figure 5). Similarly, two sprays (T3) led to an AUDPC value of 1656.03 and 54.81per cent disease reduction, while one spray (T2) was least effective among the treatments, with an AUDPC of 2011.88 and a 45.10 per cent disease reduction. Plants treated with five

sprays (T6) recorded the highest plant height (40.98 cm), number of leaves per plant (7.59), cloves per bulb (20.10), clove weight (15.38 g), bulb weight (18.13 g), yield (73.68 q/ha), yield increase (41.67%) over control and benefit-cost ratio (3.43) followed by plants treated with four sprays (T5) recorded plant height (40.69 cm), number of leaves per plant (7.41), cloves per bulb (19.14), clove weight (15.10 g), bulb weight (17.38 g), yield (72.07 q/ha), yield increase (38.57%) over control and benefit-cost ratio (3.39) (Table 6 and Figure 6). Next best treatment was plants treated with three sprays (T4) recorded plant height (39.86 cm), number of leaves per plant (7.31), cloves per bulb (18.23), clove weight (13.63 g), bulb weight (16.63 g), yield (70.27 q/ha), yield increase (35.11%) over control and benefit-cost ratio (3.34). However, untreated control plants recorded lowest plant height (34.51 cm), number of leaves per plant (6.11), cloves per bulb (11.96), clove weight (8.88 g), bulb weight (10.75 g), yield (52.01 q/ha) and benefit-cost ratio (2.56).

Previous studies by Hossain *et al.* (2019) and Mahendra *et al.* (2021) have similarly demonstrated that strobilurin and triazole based fungicides like azoxystrobin + tebuconazole significantly reduced disease intensity and enhanced garlic productivity. The results further support that, the combination of azoxystrobin and tebuconazole at 0.15 per cent provides both protective and curative action against *A. porri*, enhancing photosynthetic efficiency and overall plant vigor (Sharma *et al*., 2020). The incremental increase in B:C ratio with more sprays. Treatments with fewer sprays also showed promising results, this demonstrates the effectiveness of the two fungicides, azoxystrobin and tebuconazole, in reducing disease severity even with fewer applications. The results are consistent with earlier studies that have reported the efficacy of fungicides like azoxystrobin + tebuconazole in controlling fungal diseases in various crops, including garlic (Abdelkader *et al*., 2015; Hossain *et al*., 2020). The treatment with two sprays (T3) also significantly reduced disease severity suggesting that even with a moderate number of applications, a considerable reduction in disease can be achieved. The enhanced control with multiple sprays can be attributed to the combined action of azoxystrobin and tebuconazole. Azoxystrobin fungicide inhibits mitochondrial respiration in pathogens, while tebuconazole impedes ergosterol biosynthesis together providing both preventive and curative action (Gisi *et al*., 2002; FRAC, 2022). Their systemic nature ensures translocation and residual activity, which is critical for managing foliar fungal pathogens like *Alternaria porri*. These findings align with earlier studies by Hossain *et al*. (2020) and Kumar *et al*. (2019), who reported that combined spray with azoxystrobin + tebuconazole significantly reduced AUDPC values and increase disease control efficiency in garlic and onion crops affected

by *Alternaria* spp. Overall, the results of the present study clearly indicated that purple blotch caused by *A. porri* significantly reduces plant growth and yield when left unmanaged. The combination fungicide azoxystrobin + tebuconazole at 0.15 per cent proved highly effective in suppressing the pathogen, improving vegetative growth and enhancing yield attributes.

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Table 1. Impact of protective sprays on yield loss assessment due to purple blotch of garlic caused by *Alternaria porri* during *rabi* 2021-22

Treatments	Per cent Disease Index (PDI) at weekly intervals											Per cent disease reduction over control
	60 DAT	67 DAT	74 DAT	81 DAT	88 DAT	95 DAT	102 DAT	109 DAT	116 DAT	123 DAT	AUDPC values	
T_1	37.24 (37.61)*	40.49 (39.52)	45.75 (42.56)	52.24 (46.29)	57.04 (49.02)	63.23 (52.68)	66.76 (54.79)	69.51 (56.48)	71.77 (57.90)	73.74 (59.18)	3655.62	-
T_2	37.76 (37.91)	34.52 (35.97)	31.53 (34.14)	30.75 (33.68)	30.01 (33.21)	30.48 (33.52)	31.26 (33.99)	31.52 (34.14)	32.26 (34.60)	32.27 (34.60)	2011.40	44.98
T_3	38.02 (38.06)	34.24 (35.82)	31.77 (34.29)	26.52 (30.98)	23.02 (28.66)	23.02 (28.66)	21.75 (27.80)	22.24 (28.14)	22.74 (28.49)	23.26 (28.83)	1545.85	57.71
T_4	37.48 (37.76)	34.52 (35.97)	31.51 (34.14)	26.26 (30.82)	22.76 (28.49)	20.25 (26.74)	19.51 (26.20)	19.26 (26.02)	18.77 (25.66)	18.52 (25.47)	1497.60	59.03
T_5	37.76 (37.91)	33.98 (35.67)	31.53 (34.14)	26.24 (30.82)	21.75 (27.80)	18.51 (25.47)	17.51 (24.73)	17.23 (24.54)	17.02 (24.35)	17.02 (24.35)	1478.03	59.57
T_6	38.03 (38.06)	33.77 (35.52)	30.73 (33.68)	25.53 (30.33)	19.52 (26.20)	17.02 (24.35)	16.24 (23.77)	15.50 (23.18)	14.53 (22.38)	14.26 (22.18)	1392.88	61.89
S.Em. ±	NS	0.184	0.190	0.196	0.212	0.169	0.182	0.242	0.213	0.182	-	-
C. D. at 5%	NS	0.555	0.573	0.590	0.638	0.510	0.550	0.731	0.641	0.547	-	-

T1-Untreated control T2-One spray (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 %

T3- Two sprays (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 % T4- Three sprays (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 %

T5- Four sprays (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 % T6- Five sprays (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 %* Figures in parentheses are arcsine transformed values DAT-Days after transplanting AUDPC- Area under disease progressive curve

Table 2. Growth and yield parameters of yield loss assessment due to purple blotch of Garlic caused by *Alternaria porri* during *rabi* 2021-22

Treatments	Plant height (cm)	No of leaves/plant	No of cloves /bulb	Clove weight (g)	Bulb weight(g)	Yield (q/ha)	Per cent yield increased over control	B:C Ratio
T_1	35.03	6.18	11.80	8.75	10.50	52.55	-	2.70
T_2	37.80	6.85	13.75	10.50	13.25	60.93	15.95	3.09
T_3	38.58	7.13	16.20	12.75	14.98	67.92	29.25	3.41
T_4	39.63	7.25	18.25	13.75	16.25	70.03	33.26	3.48
T_5	40.83	7.38	19.12	14.50	17.25	72.09	37.18	3.54
T_6	41.03	7.58	19.90	15.12	18.10	73.52	39.91	3.57
S.Em. ±	0.355	0.095	0.230	0.302	0.376	0.310	-	-
C.D. at 5%	1.069	0.278	0.692	0.909	1.132	0.934	-	-

T1-Untreated control

T2-One spray (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 %

T3- Two sprays (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 %

T4- Three sprays (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 %

T5- Four sprays (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 %

T6- Five sprays (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 %

Table 3. Impact of protective on yield loss assessment due to purple blotch of garlic caused by *Alternaria porri* during *rabi* 2022-23

Treatments	Per cent Disease Index (PDI) at weekly intervals											Per cent disease reduction over control
	60 DAT	67 DAT	74 DAT	81 DAT	88 DAT	95 DAT	102 DAT	109 DAT	116 DAT	123 DAT	AUDPC values	
T_1	37.49 (37.76)*	41.24 (39.96)	45.23 (42.27)	52.75 (46.58)	57.51 (49.31)	63.77 (52.98)	67.27 (55.09)	68.76 (56.01)	72.24 (58.21)	74.26 (59.51)	3642.50	-
T_2	37.77 (37.91)	34.24 (35.82)	31.23 (33.99)	30.51 (33.52)	29.75 (33.05)	30.77 (33.68)	31.51 (34.14)	32.03 (34.45)	32.49 (34.76)	32.27 (34.60)	1977.62	45.71
T_3	38.24 (38.20)	34.48 (35.97)	31.53 (34.14)	26.50 (30.98)	23.28 (28.83)	23.29 (28.83)	22.23 (28.14)	22.28 (28.14)	23.24 (28.83)	23.01 (28.66)	1662.16	54.37
T_4	37.48 (37.76)	34.55 (35.97)	31.58 (34.14)	26.02 (30.66)	22.51 (28.32)	20.54 (26.92)	19.58 (26.20)	19.48 (26.20)	18.79 (25.66)	18.53 (25.47)	1547.36	57.52
T_5	37.98 (38.06)	34.02 (35.67)	31.51 (34.14)	25.77 (30.49)	21.74 (27.80)	18.53 (25.47)	17.55 (24.73)	17.24 (24.54)	16.77 (24.16)	16.78 (24.16)	1473.61	59.54
T_6	37.75 (37.91)	33.77 (35.52)	30.73 (33.68)	25.47 (30.33)	19.28 (26.02)	17.02 (24.35)	16.06 (23.58)	15.23 (22.98)	14.28 (22.18)	13.77 (21.76)	1383.04	62.03
S.Em. ±	NS	0.187	0.208	0.220	0.202	0.168	0.209	0.196	0.211	0.171	-	-
C.D. at 5%	NS	0.564	0.624	0.661	0.608	0.509	0.625	0.589	0.636	0.516	-	-

T1-Untreated control T2-One spray (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 %

T3- Two sprays (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 % T4- Three sprays (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 %

T5- Four sprays (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 % T6- Five sprays (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 %

* Figures in parentheses are arcsine transformed values DAT-Days after transplanting AUDPC- Area under disease progressive curve

Table 4. Growth and yield parameters of yield loss assessment due to purple blotch of Garlic caused by *Alternaria porri* during *rabi* 2022-23

Treatments	Plant height (cm)	No of leaves/plant	No of cloves /bulb	Clove weight (g)	Bulb weight (g)	Yield (q/ha)	Per cent yield increased over control	B:C Ratio
T_1	34.00	6.05	12.13	9.10	11.12	51.47	-	2.42
T_2	37.03	6.98	13.83	10.75	13.50	60.71	17.95	2.82
T_3	39.43	7.25	16.25	12.50	15.50	66.93	30.03	3.08
T_4	40.10	7.38	18.20	13.50	17.04	70.51	36.99	3.20
T_5	40.55	7.45	19.15	15.50	17.50	72.05	39.98	3.23
T_6	40.93	7.60	20.30	15.75	18.25	73.83	43.44	3.28
S.Em. ±	0.393	0.077	0.288	0.284	0.333	0.508	-	-
C.D. at 5%	1.181	0.232	0.865	0.855	1.001	1.531	-	-

T1-Untreated control

T2-One spray (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 %

T3- Two sprays (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 % 0.15 %

T4- Three sprays (azoxystrobin 11 % + tebuconazole 18 %) at

T5- Four sprays (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 % 0.15 %

T6- Five sprays (azoxystrobin 11 % + tebuconazole 18 %) at

Table 5. Impact of protective on yield loss assessment due to purple blotch of garlic caused by *Alternaria porri* during *rabi* 2021-22 and 2022-23 (Pooled data)

Treatments	Per cent Disease Index (PDI) at weekly intervals											Per cent disease reduction over control
	60 DAT	67 DAT	74 DAT	81 DAT	88 DAT	95 DAT	102 DAT	109 DAT	116 DAT	123 DAT	AUDPC values	
T_1	37.38 (37.69)*	40.88 (39.74)	45.51 (42.42)	52.48 (46.43)	57.25 (49.17)	63.51 (52.83)	67.02 (54.94)	69.13 (56.24)	72.02 (58.05)	74.01 (59.34)	3664.43	-
T_2	37.75 (37.91	34.38 (35.90)	31.38 (34.07)	30.63 (33.60)	29.88 (33.13)	30.63 (33.60)	31.38 (34.06)	31.76 (34.30)	32.38 (34.68)	32.24 (34.60)	2011.88	45.10
T_3	38.12 (38.13)	34.38 (35.89)	31.63 (34.22)	26.50 (30.98)	23.13 (28.74)	23.13 (28.74)	22.04 (27.97)	22.25 (28.14)	23.02 (28.66)	23.02 (28.66)	1656.03	54.81
T_4	37.49 (37.76)	34.51 (35.97)	31.53 (34.14)	26.13 (30.74)	22.63 (28.40)	20.38 (26.83)	19.52 (26.20)	19.38 (26.11)	18.77 (25.66)	18.48 (25.47)	1545.83	57.82
T_5	37.88 (37.98)	34.01 (35.67)	31.48 (34.14)	25.97 (30.66)	21.77 (27.80)	18.48 (25.47)	17.53 (24.73)	17.23 (24.54)	16.88 (24.25)	16.88 (24.25)	1475.29	59.74
T_6	37.88 (37.98)	33.76 (35.52)	30.73 (33.68)	25.48 (30.33)	19.38 (26.11)	17.03 (24.35)	16.13 (23.68)	15.38 (23.08)	14.38 (22.28)	14.13 (22.08)	1397.69	61.86
S.Em. ±	NS	0.170	0.185	0.196	0.187	0.156	0.172	0.183	0.178	0.127	-	-
C.D. at 5%	NS	0.513	0.558	0.590	0.563	0.469	0.517	0.551	0.535	0.384	-	-

T1-Untreated control

T2-One spray (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 %

T3- Two sprays (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 %

T4- Three sprays (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 %

T5- Four sprays (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 %

T6- Five sprays (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 %

* Figures in parentheses are arcsine transformed values DAT-Days after transplanting AUDPC- Area under disease progressive curve

Table 6. Average growth and yield parameters of yield loss assessment due to purple blotch of garlic caused by *Alternaria porri* during *rabi* 2021-22 and 2022-23.

Treatments	Plant height (cm)	No of leaves/plant	No of cloves /bulb	Clove weight (g)	Bulb weight(g)	Yield (q/ha)	Per cent yield increased over control	B:C Ratio
T_1	34.51	6.11	11.96	8.88	10.75	52.01	-	2.56
T_2	37.41	6.91	13.79	10.63	13.38	60.82	16.94	2.96
T_3	39.00	7.19	16.23	12.63	15.25	67.42	29.63	3.24
T_4	39.86	7.31	18.23	13.63	16.63	70.27	35.11	3.34
T_5	40.69	7.41	19.14	15.10	17.38	72.07	38.57	3.39
T_6	40.98	7.59	20.10	15.38	18.13	73.68	41.67	3.43
S.Em. ±	0.308	0.07	0.225	0.207	0.292	0.288	-	-
C.D. at 5%	0.929	0.214	0.679	0.624	0.877	0.867	-	-

T1-Untreated control

T2-One spray (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 %

T3- Two sprays (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 %

T4- Three sprays (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 %

T5- Four sprays (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 %

T6- Five sprays (azoxystrobin 11 % + tebuconazole 18 %) at 0.15 %