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Efficacy of organic amendments against the purple blotch of garlic caused by *Alternaria porri* (Ellis) Cif.

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Abstract
Garlic (*Allium sativum* L.) is an important crop grown throughout world. The crop attacked by various pathogens, among them fungal pathogen *Altenaria porri* (Ellis) Cif. causing purple blotch disease of garlic is an important plant pathogen and leading to great loss in yield and quality of crop. In this study the response of different organic manure were tested against purple blotch disease of garlic. Among all the treatments, the minimum disease index was recorded in T_2 poultry manure (26.87%) followed by T_4 neem cake (33.13%), T_3 goat manure (33.90 %), T_1 farm yard manure (36.00%) and T_5 vermi compost (38.67%) as compare to control T_0 (48.77%). The maximum plant height was recorded in treatment T_2 poultry manure (58.13cm), followed by T_4 neem cake (55.93 cm), T_3 goat manure (55.40 cm), T_1 farm yard manure (55.13cm) while lowest plant height was recorded in T_5 vermi compost (51.71cm) as compare to control T_0 (46.90 cm). The yield data showed that the maximum yield of garlic was recorded in treatment T_2 poultry manure (54.16 q/ha) followed by T_4 neem cake (44.16 q/ha), T_3 goat manure (42.5 q/ha), farm yard manure (40.00 q/ha) and T_5 vermi compost (26.66 q/ha) as compared with control T_0 (26.42 q/ha). Result of this study revealed that poultry manure can be used in against purple blotch disease and also showed growth promoting activity.

Keywords: *Alternaria porri*, Garlic, Organic amendments and Purple blotch

Introduction
Garlic (*Allium sativum* L.) is an important crop cultivated in India and used as spice and vegetable. It is one of the important bulb crops grown and used as a spice or condiment in India. It is also an important foreign exchange earner for India. It is cultivated in Madras, Andhra Pradesh, Uttar Pradesh, Gujarat and Maharashtra. India is the second major producing country next after China. The crop attacked by various pathogens, among them fungal pathogen *Altenaria porri* (Ellis) Cif. causing purple blotch of garlic is an important plant pathogen and it leading to great loss in yield and quality of garlic crop. Symptoms of the disease start as pale blemishes, yellow lesions, and soft spots it includes clove decay and stunted plant. In favorable conditions, epidemic may cause total failure of the crop. Severe loss was recorded due to purple blotch disease in Maharashtra during *kharif* (Gupta and Srivastava, 1993) [2]. Purple blotch causes 20-60% loss in Punjab, Haryana and Maharashtra (Sandhu *et al.*, 1981; Thind and Jhooty, 1982) [5, 6]. Management of disease through chemicals is not always effective and desirable. To manage purple blotch of garlic with organic amendments present studies were conducted.

Materials and methods
The present study was conducted under at central field of Department of Plant pathology, Sam Higginbottom University of Agriculture, Technology and Sciences, during the Rabi season of 2016-17. The trial was carried out in Randomized Block Design with three replications and six treatments along with control. Treatments were T_1 farm yard manure (FYM) (17.5t/ha), T_2 poultry manure (12.5t/ha), T_3 goat manure (17.5t/ha), T_4 neem cake (500kg/ha), T_5 vermi compost (13.50 t/ha) and control (T_0). Observations were recorded on plant height, number of leaves, disease incidence and on yield were recorded. Observations on *Alternaria porri* disease intensity were recorded on randomly selected plants from the diseased infected bulbs. Screening was done on 0-9 point rating scale based on leaf area covered by the pustules (Mayee and Datar, 1986) [1]. Ten plants at bulb developmental stage were randomly selected for scoring the disease at fortnightly intervals. Percent disease index (PDI) was calculated on the basis of rating scale and the total number of plants observed as given below.

$$\text{Percent disease index} = \frac{\text{Sum of all disease ratings}}{\text{Total number of rating} \times \text{Maximum disease grade}} \times 100$$

The grade significance: 0 -Absolutely free from infection; 1- Small sized lesions on the leaf covering <1% area; 2 - Small sized lesions on the leaf covering <2-5% area; 3- Small sized lesions on the leaf covering < 6-10% area; 4- Small sized lesions on the leaf covering <11-15% area; 5- Small sized lesions on the leaf covering < 16-25% area; 6: 26-40% area covering; 7: 41-60% area covering; 8: 61-75% area covering; 9: >75% area covered with spot, most of the leaves dried.
Cost benefit ratio (CBR) = Gross Return (Rs /ha) / Total cost of cultivation (Rs/ha).

Results and discussion

The data presented in table 1 and depicted in figure 1 reveals the response of different organic manures on the disease incidence and growth parameters of garlic crop. The results indicated that all the treatments were significantly reduced the disease incidence (Plate 1) of purple blotch as compared to control. The minimum disease index was recorded in T_2 poultry manure (26.87%) followed by T_4 neem cake (33.13%), T_3 goat manure (33.90 %), T_1 farm yard manure (36.00%) and T_5 vermi compost (38.67%) as compare to control T_0 (48.77%). The maximum plant height was recorded in treatment T_2 poultry manure (58.13cm), followed by T_4 neem cake (55.93 cm), T_3 goat manure (55.40 cm), T_1 farm yard manure (55.13cm) while lowest plant height was recorded in T_5 vermi compost (51.71cm) as compare to control T_0 (46.90 cm).

Perusal of the data also indicated that among all the treatments the maximum number of leaves was recorded in T_2 poultry manure (5.60) and T_4 neem cake (5.60), followed by T_3 goat manure (5.27), T_1 farm yard manure (5.20), T_5 vermi compost (5.00) as compare to T_0 control (3.43). The yield data showed that the maximum yield of garlic was recorded in treatment T_2 poultry manure (54.16 q/ha) followed by T_4 neem cake (44.16 q/ha), T_3 goat manure (42.5 q/ha), farm yard manure (40.00 q/ha) and T_5 vermi compost (26.66 q/ha) as compared with control T_0 (26.42 q/ha). From the cost benefit ratio the most beneficial result with high CB ratio was obtained in poultry manure (1:3.71) followed by neem cake (1:3.03), goat manure (1:2.91), farm yard manure (1:2.74) and vermi compost (1:1.8). However, some treatments were found non significant with each other but there was significant increase in numbers of branches in all the treatments over control.

Organic manure showed disease suppression and plant growth promoting activity may because of some biocontrol property in the manure on the other hand organic manure known to support plant growth. These findings also supported by the finding of Vargas-García *et al*. (2005) [7] also suggested that farming wastes could be used as substrate for the conservation and mounting of biocontrol agents. Many types of composted material have been shown to suppress diseases like cattle manure and FYM (Reuveni *et al*., 2002; Khan *et al*. 2014) [4, 3].

Table 1: Effect of different organic amendments on various parameters of garlic plant

Treatments		Plant height (cm)	Number of leaves/plant	Disease incidence (%)	Average Yield (q/ha)	C:B ratio
T_0	Control	46.90	4.53	48.77	26.42	1:1.46
T_1	Farmyard manure	55.13	4.87	36.00	40.00	1:2.74
T_2	Poultry manure	58.13	5.87	26.87	54.16	1:3.71
T_3	Goat manure	55.40	4.93	33.90	42.50	1:2.91
T_4	Neem cake	55.93	4.93	33.13	44.16	1:3.03
T_5	Vermi compost	51.71	4.64	38.67	26.66	1:1.80
F- test		S	S	S		
S. Ed. (±)		1.45	0.25	1.45		
C. D. (5%)		3.23	0.55	3.24		

Plate 1: Purple blotch infected leaves of garlic

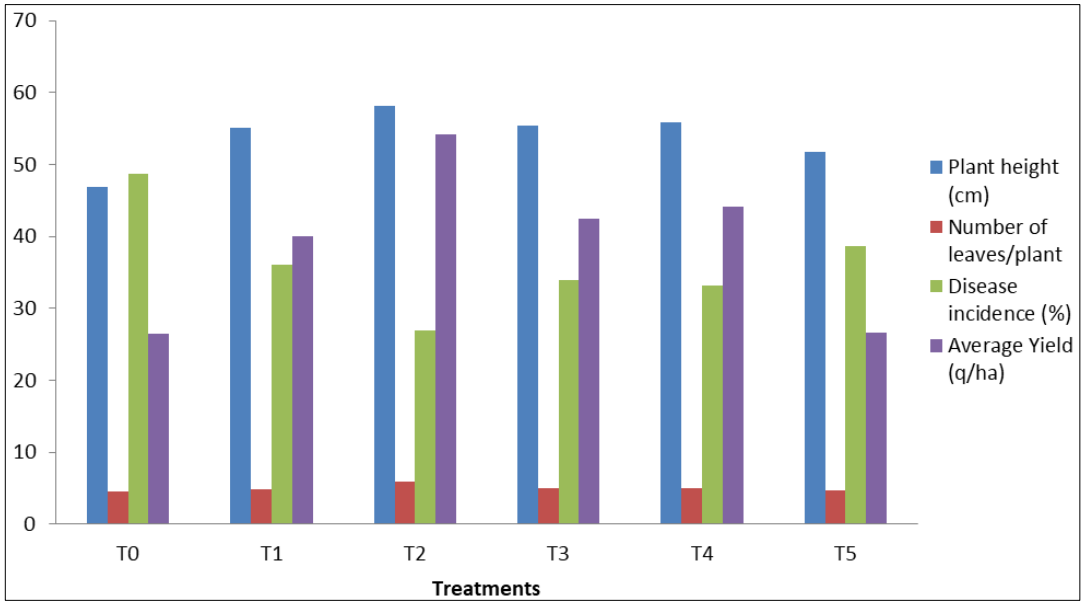

Fig 1: Effect of different organic amendments on various parameters of garlic plant

Conclusion

The findings from present study suggested that poultry manure (12.5t/ha) and neem cake (500 kg/ha) were found as best treatments to minimize purple blotch disease of garlic whereas effects on the environment as well as the person who handles it, while application in the field and consumers using the product, use of organic manures in field condition could be considered as better, as it is beneficial and eco-friendly. Since, one year data is not sufficient to conclude concurrent results; further experimentations are required to confirm the findings.

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