# Effect of neem cake, neem oil and plant extracts on purple blotch of onion (*Allium cepa* L.) caused by *Alternaria porri* (Ellis) Cif.


## Abstract

The present study was conducted to evaluate the Effect of neem cake, plant extracts and neem oil on purple blotch of onion (*Allium cepa* L.) caused by *Alternaria porri* (Ellis) Cif.Six different treatments were tested in a randomized block design with 3 replicationsat the Central Research Field, Department of Plant Pathology, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during *Rabi* season of 2023. The results showthat the minimum per cent disease intensity was recorded in $T_1$Neem cake + Neem oil (31.72), $T_5$ Neem cake + Eucalyptus leaf extract (37.40). bulb weight of onion (71.13g), bulb diameter (7.13cm), bulb yield per plot (2.106kg), yield (105.317 q/ha) and benefit-cost ratio (1: 4.42) were found in $T_1$Neem cake + Neem oil (31.72) when compared to untreated check and other treatments.



**Keywords:***Alternaria porri*, neem cake, neem oil, onion, plant extract, purple blotch.




## 1 Introduction

Onion (*Allium cepa* L.) is one of the most important vegetable crops belongs to the family Amaryllidaceae.There are more than 780 species, usually perennial bulbous plants grown worldwide**(Mukul *et al*. 2024)**.

Onion is also called as "Queen of kitchen". It contains a phytochemical called quercetin which is effective in reducing the risk of cardiovascular diseases, and anticancersand has antioxidant properties It is supposed to have its origin in middle East Asian countries and was introduced in India from Palestine **(Kareem *et al.*, 2018)**.

Production of Onion in 2022 is expected to be around 254.73 lakh tone **(APEDA,2022**).In India, the yield of onion is very low as compared to the world average yield of 19.1t/ha**(Bhoite and Backiyavathy, 2022)**.

The most important factors responsible for the diseases like purple blotch, downy mildew, stem phylium blight, basal rot and storage rots. Among the foliar diseases, purple blotch is one of the most destructive diseases, commonly prevailing in almost all onion-growing pockets of the world, which causes heavy loss in onions under field conditions. Losses can range from 30 to 100 per cent.Thedisease may reach epidemic states during the favourableconditions of high relative humidity (80-90%) and optimum temperature (24±10ºC). Purple blotch disease of onion causes a significant reduction in foliar production and bulb yield **(Gupta and Pathak, 1988)**.

Several effective fungicides have been recommended against this pathogen, but they are considered as a long-term solution, due to concerns of expense, exposure risks and the hazards of its residues. Moreover, the development of resistance of pathogenic fungi towards synthetic pesticides is of great concern andcan affect significantly the efficacy of chemical fungicides.The present study aimed to determine the efficacies of different bio-agents and neem oil against purple blotch of onion **(Chethana *et al.*, 2015)**.

## 2 Materials and Methods

The study was conducted in a randomized block design (RBD) with plot size 2x1m² and there were three replications for each treatment. The experiment was conducted on Nasik redvariety of onion.Observations on disease intensity ofpurple blotch of onion were recorded at 30 days interval, bulb weight of onion (g), bulb diameter (cm), bulb yield per plot (kg), yield (q/ha) andB:C ratio data were obtained after the harvest on physiological maturity.

**Table 1 Treatments combination**

| Treatment Number | Treatment Details | References |
|---|---|---|
| **$T_0$** | Control (Untreated) | - |
| **$T_1$** | Neem cake @440gm (S.A) + Neem oil 5% (F.S) | **Kumar (2007)** |
| **$T_2$** | Neem cake @440g (S.A) + Datura leaf extract @10% (F.S) | **Brahmane*et al*. (2015)** |
| **$T_3$** | Neem cake @440g (S.A) + Lantana leaf extract @10% (F.S) | **Brahmane*et al*. (2015** |
| **$T_4$** | Neem cake @440g (S.A) + Bael leaf extract @10% (F.S) | **Kumar (2007)** |
| **$T_5$** | Neem cake @440g (S.A) + Eucalyptus leaf extract@10% (F.S) | **Kumar (2007)** |
| **$T_6$** | Mancozeb @0.2% (F.S) (Treated check) | **Chethana *et al*. (2011)** |

**Dose: Neem cake @440g 2m$^2$(S.A),Plant extract (10%),neem oil (5%) and mancozeb (0.2%)**

**S.A: - Soil amendment** **F.S: - Foliar spray**

**2.1 Preparation of plant extracts**

A hundredgrams of fresh healthy plant parts (leaves) collected from the field werewashed with distilled water and airdried and crushed in 100 ml of distilled water (w/v). The crushed product was filtered through a double layer, of muslin cloth and further filtrated through Whatsman No. 1 filter paper using a funnel and volumetric flasks (100 ml cap.). The prepared solution was 100 per cent concentration, which was further diluted to the required concentrations of 10 per cent**(Shekhawat and Prasada, 1971).**

**2.2 Percent disease intensity (PDI)**

Percent disease index was calculated by using the following formula **(Wheeler, 1969).**

$$\text{Percent Disease Index (PDI)} = \frac{\text{Sum of individual ratings}}{} \times \frac{100}{}$$

No of leaves observed Maximum disease grade

To calculate the PDI, five plants were randomly examined from each plot and scored for disease severity using the 0-5 scale established by **Sharma, (1986).**

**Table 2Disease rating scale**

| **Scale** | **Description** |
|---|---|
| 0 | No disease symptoms |
| 1 | A few spots towards tip covering 10% leaf area |
| 2 | Several dark purplish brown patches covering up to 20% leaf area. |
| 3 | Several patches with paler outer zone covering up to 40% leaf area. |
| 4 | Leaf streaks covering up to 75% leaf area or breaking of the leaves from center. |
| 5 | Complete drying of the leaves or breaking of the leaves from center. |

**0 1 2 3 4 5**

**Figure 1 Disease rating scale**

**3Results**

**3.1 Effect of neem cake, plant extracts and neem oil on disease intensity of purple blotch of onion**

Thestatisticallyanalyzed data presented in **Table 3** and depicted in **Figure 2 reveal**the effect of the organic amendment, plant extracts and neem oil on disease intensity of *Alternaria porri* on

onion under field conditions. The treatments were found to have significantly reduced disease intensity as compared to the control (untreated check). As the treated check ($T_6$) mancozeb @0.2% reduced the disease intensity of purple blotch of onion at its maximum point within the treatmentsNeem cake + Neem oil ($T_1$) showed maximum reduction of disease intensity ofNeem cake + Eucalyptus leaf extract ($T_5$), Neem cake +Lantana leaf extract ($T_3$), Neem cake + Bael leaf extract ($T_4$)and Neem cake + Datura leaf extract ($T_2$)the highest disease was recorded incntrol ($T_0$) (Untreated check) with (59.19) % disease intensity.

**3.2Effect of neem cake, plant extracts and neem oil on bulb weight of onion (g), bulb diameter (cm), bulb yield per plot (kg) and yield (q/ha) of onion**

The data presented in **Table 4** and depicted in **Figure 3** reveals the response of selected treatments of organic amendment, plant extracts and neem oil on bulb weight of onion(g), bulb diameter (cm), bulb yield per plot (kg) and yield (q/ha)of onion under field conditions. The results indicate that the untreated check $T_0$ (control) show significant reduction for all the replications. The maximum data was recorded $T_1$Neem cake + Neem oil on fresh weight of bulb (68.80gm),the diameter of the bulb (6.80cm), bulb yield per plot (1.968kg),bulb yield **(**98.383q/ha**)** the lowest data was recorded in control($T_0$) (Untreated check).

**4 Discussions**

The probable reasons for such findings may be due to the soil application of neem cake that could have improved the availability of nutrients to the crop by enhancing the mineralization and supply of readily available nutrients to the soil microbial community which may have supported the plant growth by **Sharma *et al.* (2019)**. Whereas, neem oil was used as a foliar spray that may have inhibited the emergence of fungal pathogensdue to the existence of major components such as azadirachtin, saladin, nimbi, nimonol and iso-meldenin**(Hinduja *et al*.,2021)** which have the ability to disrupt the cell membrane and facilitate intracellular compound leakages lead to cell lysis resulting in healthy plant growth. Similar findings have been reported by **Sindu *et al.* (2022)**and **Divya *et al.* (2022)**.who revealed that the maximum disease inhibition was found in the neem oil treatment, suggesting that the use of garlic extracts could be a viable approach to control *Alternaria porri*. Though among all the treatments chemical fungicide (Treated check)

has shown the minimum disease control with a strong fungicidal effect against the pathogen. As of now, it may produce some toxic chemical residues, which may have potentiallyharmful effects onnon-targeted organisms. So, considering the ecosystem, neem oil significantly inhibits the pathogen and could lead to better health of the plants which in turn helps in producing minimum disease intensity and leading to a healthier plant and environment friendly.

**Table 3 Effect of neem cake, neem oil and plant extracts on disease intensity of purple blotch of onion**

| Treatment Number | Treatment Details | Disease intensity (%) | | |
|---|---|---|---|---|
| | | 30 DAT | 60 DAT | 90 DAT |
| $T_0$ | Control (Untreated) | 10.41 | 38.60 | 59.19 |
| $T_1$ | Neem cake + Neem oil | 8.11 | 19.43 | 31.72 |
| $T_2$ | Neem cake + Datura leaf extract | 9.45 | 27.40 | 45.31 |
| $T_3$ | Neem cake + Lantana leaf extract | 8.85 | 23.44 | 41.57 |
| $T_4$ | Neem cake + Bael leaf extract | 9.15 | 25.46 | 43.60 |
| $T_5$ | Neem cake +Eucalyptus leaf extract | 8.75 | 21.54 | 37.40 |
| $T_6$ | Mancozeb (Treated check) | 7.98 | 15.49 | 19.46 |
| | **CD (5%)** | **0.90** | **0.63** | **0.26** |

**Table 4 Effect of neem cake, plant extracts and neem oil on bulb weight of onion (g), bulb diameter (cm), bulb yield per plot (kg) and yield (q/ha) of onion**

| Treatment Number | Treatment Details | Bulb weight(g) | Bulb diameter(cm) | bulb yieldper plot (kg) | yield (q/ha) |
|---|---|---|---|---|---|
| $T_0$ | Control (Untreated) | 40.43 | 3.40 | 1.370 | 39.817 |
| $T_1$ | Neem cake + Neem oil | 68.80 | 6.80 | 1.968 | 98.383 |
| $T_2$ | Neem cake + Datura leaf extract | 57.86 | 4.86 | 1.538 | 80.900 |
| $T_3$ | Neem cake + Lantana leaf extract | 61.40 | 5.92 | 1.751 | 89.567 |
| $T_4$ | Neem cake + Bael leaf extract | 59.53 | 5.43 | 1.645 | 86.233 |
| $T_5$ | Neem cake +Eucalyptus leaf | 64.20 | 6.15 | 1.869 | 93.450 |

| | | | | | |
|---|---|---|---|---|---|
| | extract | | | | |
| $T_6$ | Mancozeb (Treated check) | 71.13 | 7.13 | 2.106 | 105.317 |
| | **CD (5%)** | **0.16** | **0.05** | **0.07** | **0.83** |

## 5 Conclusion

From the results of thisstudy it maybe concluded that neem cake (Soil amendment) + neem oil (Foliar spray) recorded the minimum disease intensity of purple blotch of Onion caused by *Alternaria porri* (Ellis) Cif. and bulb weight of onion (g), bulb diameter (cm), bulb yield per plot (kg), yield (q/ha) and benefit-cost ratio of onion. The present investigation was limited to one crop season (*Rabi*, 2023-24), under the agroclimatic conditions of Prayagraj (U.P.) hence, additional research is necessary to validate the findings of the study as the data collected for one crop season is inadequate to make definite conclusions.

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