MANAGEMENT OF STEMPHYLIUM BLIGHT OF ONION THROUGH SOME SELECTED TREATMENTS

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MANAGEMENT OF STEMPHYLIUM BLIGHT OF ONION THROUGH SOME SELECTED TREATMENTS

BY

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This is to certify that the thesis entitled **"Management of Stemphylium Blight of Onion Through some Selected Treatments"** submitted to the faculty of Agriculture, Sher-e-Bangla Agricultural University, Dhaka, in partial fulfillment of the requirements for the degree of Master of Science in Plant Pathology, embodies the result of a piece of bonafide research work carried out by Morjina Khatun Roll and Registration no. 25244/00616 under my supervision and guidance. No part of the thesis has been submitted for any other degree or diploma.

I further certify that any help or source of information, as has been availed of during the course of this investigation has duly been acknowledged.

Dated:
Dhaka, Bangladesh

.....
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CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

MANAGEMENT OF STEMPHYLIUM BLIGHT OF ONION THROUGH SOME SELECTED TREATMENTS
Stemphylium vesicarium

BY

MORJINA KHATUN

ABSTRACT

A study was carried out for the management of stemphylium blight of onion (*Stemphylium vesicarium*) through some selected treatments during the period of December, 2006 to April, 2007 at the farm of Sher-e-Bangla Agricultural University, Dhaka-1207. The experiment was laid out in the Randomized Complete Block Design (RCBD) with three replications. A local onion variety Taherpuri was used in the experiment. Treatment of onion bulb followed by foliar spraying with eight fungicides viz., Score, Tilt-250 EC (Propiconazole), Dithane M-45 (Mancozeb), Champion, Cupravit, Ridomil MZ-72 (Metalaxyl + Mancozeb), Rovral 50 WP (Iprodione), Bavistin (Carbendazim) and one botanical treatment viz. Neem leaf extract (1:5) with control were applied in the experiment. Treatment followed by six (6) foliar spraying at 10 days interval starting from 20 days after planting with Rovral (0.2%) or Dithane M-45 (0.45%) minimized disease incidence & severity and increased seed yield. The least leaf infection by *Stemphylium vesicarium* and the highest bulb yield was recorded in the sample from Rovral and Dithane M – 45 treated plot.

CHAPTER 1

INTRODUCTION

Onion is an important spice as well as vegetable crop, commercially grown in many countries of the world including Bangladesh. This is the member of the family Alliaceae. The major onion growing areas of the country are Faridpur, Comilla, Manikgonj, Dinajpur, Jessore, Pabna, Rajshahi, Mymensingh, Jamalpur and Rangpur (BBS, 1993). Recently, Bunching onion (*Allium fistulosum*) is coming up as a popular vegetable. It does not form bulbs but grows in clusters with long white stems (Benoit and Coustermans, 1987).

Onion has manifold uses; such as spice, vegetable, salad dressing etc. It is also used as condiments for flavouring a number of foods and medicines (Vohora *et al.*, 1974). Raw onion is being used and given protection to human beings from sun stroke, normally is consumed green as well as in mature stages almost by every one, by different means. The crop is of importance in earning foreign currency through export and in case of shortages onion is imported by spending huge currency. In terms of global weight of vegetable produced, nearly 28 million tons onion bulbs per annum next to tomatoes and cabbages bears importance (FAO, 1991). In Bangladesh, the production of onion is nearly 1,43,000 tons from 34,000 hectares of land (FAO, 1993). The production of onion was nearly 1,27,000 metric tons from 84,000 acres of land during 2000-2001, which increased up to 91000 hectares and 150 thousand tons during 2001-2002, respectively (BBS, 2002). The annual yield of onion of the country is

only 4 tons/ha (BBS, 2002), which is quite low compared to other onion growing countries of the world.

The local varieties namely Faridpuri and Taherpuri are commonly grown. The high yielding variety, such as- BARI 1, BARI 2, BARI 3 also are now famous for cultivation in Bangladesh. In Bangladesh, the demand of bulb onion as well as the onion seeds is increasing every year and the price of the true seeds remains fairly high in each season.

In Bangladesh, several major diseases become widespread and serious enough to limit production. Among the major diseases commonly known as stemphylium blight (*Stemphylium vesicarium*), purple blotch (*Alternaria porri*), downy mildew (*Peronospora destructor*) grey mold (*Botrytis sp.*) and basal/pink rot (*Fusarium sp.*) etc are the most destructive diseases, damage the crop and reduced bulb yield sometimes up to 100%. Among those diseases stemphyllium blight (*Stemphylium vesicarium*), commonly known as white blotch, caused by *Stemphylium vesicarium*, is noted as an important disease throughout the world including Bangladesh (Bose and Som 1986; Meah and Khan, 1987and Castellanos-Linares *et al.* 1988).

Stemphylium leaf blight is one of the most devastating disease of onion which initially produces small, light yellow to brown, and water-soaked lesions on the leaves and leaf sheaths. As the lesions expand, they coalesce, causing extensive blighting of the leaves. Typical lesions are found in higher numbers on the side of leaves facing the prevailing wind. The centers of lesions turn brown to tan, then dark olive brown and finally black as the fungus sporulates. Sometimes fruiting bodies called perithecia may appear in infected tissue as small, black, pinhead-like

raised bodies. Infection usually remains restricted to leaves and does not extend into the bulb scales. Long periods of warm wet conditions encourage disease development.

Stemphylium leaf blight of onion caused by *Stemphylium vesicarium* was first reported in Egypt (Hassan, *et al.* 2006). Stemphylium leaf blight (*Stemphylium vesicarium)* has been reported from Europe, Africa, North America, South America and Asia. Foliage losses of 80 to 90 percent have been reported. This fungal disease has become more widespread in Bangladesh in the onion-growing region during recent years. Disease cycle, disease epidemiology and symptoms of Stemphylium leaf blight are similar to purple blotch disease. The conidia have up to six transverse septa, besides several vertical septa. Wet and warm conditions favor the disease spread.

Under tropical conditions, the disease is a limiting factor for yield of onion. Onion seed production is severely affected because the disease causes breaking of floral stalks (Munoz *et al.* 1984). Damage of foliage and breaking of floral stalks due to Stemphylium blight resulting failure of seed production of onion are common. Onion production in Bangladesh is gradually decreasing due to this disease (BBS, 2001). For its less production, Bangladesh are being depended to the neighbouring countries like India, Barma, Pakistan for importing onion bulb and onion seed to meet up the consumption and cultivation demand.

People globally are conscious about environmental hazards due to use of costly and toxic spray chemicals. So, to save the nature and escape

polluting the environment, a judicial use of fungicide is to be employed. Thus present study was undertaken to achieve the following objectives:

1. To find out the efficacy of selected treatments in controlling Stemphylium blight of onion
2. To determine the optimum number of sprays for management of the Stemphylium blight of onion.

CHAPTER 2

REVIEW OF LITERATURE

Stemphylium blight, a common disease of onion in Bangladesh is considered as serious one as it has profound effect in reducing the yield of onion. Now it is an acute problem in the country both for the researchers and the onion growers. Management of the disease by using chemicals and biological control measures are being explored in many countries of the world. Literatures in relation to Stemphylium blight of onion are presented below:

2.1 Chemical control

Patil *et al.*, (1976) evaluated different fungicides against leaf blight of onion. In culture media the fungus was inhibited by Kitazin,Cuman, Difolatan, Vitavax, Captan, Hinosan, Dutex, Miltox, and Aureofungin. As a prophylactic spray, Kitazin was proved to be superior to all the other fungicides tried.

Joi and Sonone (1978) evaluated nine fungicides for the control of leaf blight of onion in three experiments over three years and found that Dithane M-45 reduced the disease by 23.6% and increased the yield by 35%, whereas miltox reduced the disease by 22.6% and increased the yield by 26%.

Barnoczki-stoilova *et al.* (1989) conducted trails with onion cv. Makoi Brons to determine the efficacy of several treatments (2 insecticides and 4

fungicides) for pest and disease control during flowering. At the initiation of flowering (10-15% open flowers), spraying had a beneficial effect on seed yield and plant health. Spraying at full bloom (50-60% open flowers) should be avoided for harmful effect. At the end of flowering (5-10% open flowers), spraying improved seed health. Ridomil plus 50 WP (methy1 + copper oxychloride) and Rovral 25 FW were the most effective fungicides.

Gupta *et al.*, (1992) observed that *Alternaria porri* and *Stemphylium vesicarium* cause the most important disease of onion in India. Both the diseases were successfully controlled by 4 sprays of Dithane M-45 (mancozeb) at 0.25% applied at weekly intervals.

Aveling *et al.* (1993) reported that during surveys in the Cape Province of South Africa, *Alternaria Porri* and *Stemphylium vesicarium* were found to be very destructive seed borne pathogens of onion. Six fungicides (anilazine, benomyl, carbendazim/ flusilazole mixture, procymidone, tebuconazole and thirum) were tested for their efficacy to control the diseases on the seed and in culture. None of the treatments eradicated *Alternaria porri* and *Stemphylium vesicarium* from onion seeds.

During 1992-93 and 1993-94, in Haryana, India, total failure of onion seed crop was occurred due to stemphylium blight (*Stemphylium vesicarium*) and purple blotch (*Alternaria Porri).* To overcome this alarming situation Srivastava *et al.* (1995) conducted trials with

Iprobenfos (Kitazin), Iprodione (Rovral), Fosetile (Aliette), Kavatch, Thiophanate-methyl (Topsin M), Benomyl, Metalaxyl (Ridomil) and Mancozeb. Observations on disease intensity / PDI were recorded at fortnightly intervals, just before each spray, and a total of 5 sprays were applied. They recommended that seed growers in North India should apply fortnightly sprays of 0.25% Mancozeb or 0.25% Iprodione to control onion seed diseases caused by *Stemphylium vesicarium* and *Alternaria porri.*

Gupta *et al.* (1996) undertaken studies in Karnal, Haryana, india, during kharif, 1994 and 1995 to control blight of onion. Treatment comprised of 5, 4 or 3 sprays of mancozeb, chlorathalonil and fosetyl as (Aliette) starting at 40 DAP at intervals of 10 days. It was observed that 3-4 sprays of 0.25% Mancozeb at 10 days intervals starting at 50 days after transplanting reduced infection caused by *Stemphyllium vesicarium* and *Alternaria porri.* Three sprays of 0.25% kavatch at 10 days intervals starting 60 days after transplanting was also effective.

2.2 Botanical Control

As the literatures in relation to Stemphylium blight of onion was unavailable other partial studies have been reviewed are presented below:

Lakshmanan et al. (1990) reported that aqueous extract of Neem (*Azadiracta indica*) and Baganbilas (*Bougainvillea spectabilis*) inhibited mycelial growth and sclerotial germination of *Thanatephorus cucumeris.*

Hossain and Schlosser (1993) found Neem extract to be effective against *Bipolaris sorokiniana*, kalo jira (*Nigella sativa*) extracts completely inhibited the mycelial growth and sclerotial formation of *Rhizoctonia solani*.

2.3 Other information regarding the pathogen and its management

Jouan *et al.* (1972), besides chemical treatments, treated infected plants with a spore suspension of a phylloplane fungi, *Stemphylium allii*. This raised seed yield, although control was not as effective as chemical treatments. The results of laboratory and field trials with various fungicides were inconsistent, sufficient protection was afforded by dithiocarbamate and iprodione fungicides.

Awad *et al.* (1978) found that transplanting onion seedlings on 1 December gave the highest percentage of healthy plants and disease severity decreased significantly with decreased plant density. Applications of nitrogen fertilizer at twice the normal dose increased the severity of infection, while a double dose of calcium super phosphate reduced infection. Disease incidence decreased by adding potassium chloride at twice the normal dose.

Aveling *et al.* (1993) conducted an untreated control hot water soak (50^0C for 20 minutes) and a Sodium hypochlorite treatment was also included for comparison. Treated seeds were rated for germination by the blotter

method and by emergence and seedling growth in seedling trays in green house. Sodium hypochlorite treatment did not eradicated *Alternaria Porri* and *Stemphylium vesicarium* from germinating onion seeds. The hot water soak proved to the best treatment for reducing these pathogens, although the percentage of germination and emergence of onion seedlings were reduced compared with the control.

Srivastava *et al.*, (1996) conducted an *in vitro* studies were undertaken to determine the role of infected plant debris and soil in the perpetuation of disease and air borne spore of purple blotch (*Alternaria porri*) and Stemphylium blight (*Stemphylium vesicarium*) on onions in Harayana, India, in order to establish a forecasting system for effective control measures. The pathogens remained viable for 4 months on diseased plant debris, 3 months at soil in depths of 2.5, 5.0 and 7.5 cm and for 2 months at soil in depths of 10.0 and 15.0 cm. It was suggested that the inoculum load of *Alternaria porri* and *Stemphylium vesicarium* during ploughing of infected soil was higher during the winter.

Bhonde *et al.*, (2001) observed the effect of varying irrigation frequencies and N fertilizer levels on onion cv. Agrifound Dark Red seed production during rabi 1998/99 and 1999/2000 at Nasik, Maharashtra, India. The irrigation frequencies tested were : (I_1) irrigation at 15-day intervals upto day 60, 12-day-intervals from day 60 to 100 and 8-day-intervals from day 100 until maturity; (I_2) irrigation at 12-day-intervals upto day 60 and 8-day-intervals thereafter; and (I_3) irrigation at 10-day-intervals throughout the cropping period. The N fertilizer treatments include: (N_1) 80 kg N/ha

applied in 2 splits, 50% at planting and 50% at 45 days after planting (DAP); (N_2) 100 kg N/ha applied in 2 splits, 50% at planting and 50% at 45 DAP; and (N_3) 120 kg N/ha applied in 3 splits, 33% at planting, 33% at 45 DAP and 33% at 60 DAP. Data were recorded for plant size of ambles; 100-seed weight, seed germination and seed yield. The best crop performance was obtained under the treatment 12 and 13. No significant differences in any of these traits were observed as a result of varying Nitrogen level, while the interaction effects were only significant for seed germination.

2.4 Epideomology

Verwoperd & Du Plessis (1931) reported that the pathogen is widespread in Asia and Europe and has been recorded previously on onion plants in South Africa.

Simmons (1969) identified the telemorph of *Stemphylium vesicarium* as *Pleospora allii.*

Ellis (1971) conducted an experiment and described that the conidiophores were pale to medium brown with dark bands, smooth or minutely verruculose; conidia oblong to ovoid, densely verrucose with 1-5 transverse and several longitudinal septa, 13-21 x 25-40 µm. Ascomata forming in culture contained hyaline, bitunicate, clavate asci with 8 ascospores that were light to medium brown, ellipsoidal, verrucose with 5-7 transverse and several longitudinal septa, usually in incomplete series, 9-17 x 17-46 µm

Wu (1979) surveyed the seed-borne diseases of vegetables. Results of the survey on onion showed that *Alternaria porri* and *Stemphylium botryosum (Pleospora herbgrum)* reduced germination of onion seeds

Miller (1983) reported that measurements of infected leaves were taken weekly from bulb initiation to bulb maturity. They observed that the leaf damage levels were significantly lower on younger than older leaves. Leaves emerging 9, 8, 7, 6 and 5 week before bulbing maturity required $5^1/_2$, 5, $4^1/_2$, $3^1/_2$ and $2^1/_2$ weeks respectively to reach 50% damage within 2 weeks.

Gupta *et al.*, (1996) stated that Stemphylium Blight [*Stemphyliu vesicarium*] and purple blotch [*Alternaria porri*] are important diseases causing considerable damage to onion crops in India. Diseases are severe during the rainy season especially when thrips are also associated with the crop.

Lakra (1999) conducted an experiment at the Choudhary Charan Singh Haryana Agricultural University, Hisar, Haryana, India, found that numerous purple spots / blotches were observed on older leaves and scapes when fortnightly dew fall was >1. 0 mm, mean maximum relative huidity > 75% and mean maximum temperature 20-30^{0}C with> 18 hr favourable temperature (10-30) duration. Exposure of leaf and/or scape to wetness for 8 hr was a pre-requisite for conidial germination with increasing disease intensity, every yield component was adversely affected; the most severe infection reduced the number of scapes/ plant,

the height of scape, the number of umblets/umbel, the number of seeds/ umblet, 1000-grain weight, number of seeds/ plant and the seed yield/ plant by 28.7, 74.5, 89.9, 41.7, 35.7, 95.7 and 97.3%, respectively, compared with healthy plants.

Sharma *et al.* (2002) reported that onion seed production in Punjab was reduced by 60% - 70% due to the severe downy mildew (*Peronospora destructor*) disease outbreak on seed stalks resulting in low seed recovery and poor seed health and vigore. They detected *Fusarium, Alternaria, Stemphylium* and *Aspergillus spp.* in the onion seeds of N-53, ADR, PRR, Punjab selection, Punjab white, Punjab naroya and Punjab 48 cultivars.

CHAPTER 3

MATERIALS AND METHODS

3.1. Experimental Site:

The experiment was conducted at the farm of Sher- e- Bangla Agricultural University (SAU), Dhaka during winter season (December' 2006 to April 2007)

3.2. Climate of Experimental Site

The experimental area was under the sub tropical climate which characterized with the comparatively high rainfall, high humidity, high temperature, relatively long day during April to September and scantly rainfall, low humidity, low temperature and short day period during October to March. The soil of the experimental field was loamy.

3.3. Preparation of Soil

Land was prepared using a disc plough and harrow. Then the soil clods were broken by a wooden hammer. After ploughing, the field was left to nature for a week for sun dry. When the weeds were sufficiently dried off, the residues were removed, fertilizers applied and the land was prepared finally after a light irrigation to ensure the joo condition of the soil to have a good tilth.

3.4. Fertilizer Application

Soil was fertilized with Nitrogen (in the form of urea), Phosphorus (in the form of Triple Super Phosphate -TSP), Potassium (in the form of Muriate of Potash- MP), and cow dung during final land preparation. Whole

quantity of TSP, MP and half of urea was applied at final land preparation. The rest half of the urea was devided into two parts and applied 20 and 40 days after seedling transplanting, respectively.

Fertilizer	Doses
Urea	180 Kg/ha
TSP	205 Kg/ ha
Mp	206 Kg/ha
Cow dung	10 tons/ha

3.5. Treatment of the Experiment

9 treatments were evaluated in controlling Stemphylium blight of onion and one untreated control was done to compare. The treatments were-

1. Treatment of bulb with Score (0.05%) followed by foliar spraying
2. Treatment of bulb with Tilt-250 EC (0.05%) followed by foliar spraying
3. Treatment of bulb with Dithane M-45 (0.45%) followed by foliar spraying
4. Treatment of bulb with Champion (0.2%) followed by foliar spraying
5. Treatment of bulb with Cupravit (0.7%) followed by foliar spraying
6. Treatment of bulb with Ridomil MZ-72 (0.2%) followed by foliar spraying
7. Treatment of bulb with Rovral 50 WP (0.2%) followed by foliar spraying
8. Treatment of bulb with Bavistin (0.1%) followed by foliar spraying

9. Treatment of bulb with Neem extract (20%) followed by foliar spraying
10. Control

The fungicides used in the experiment where presented below with their active ingredient (Table-1).

Table 3.1. : Selected fungicides and their active ingredient used in the experiment.

Fungicide	Active ingredient
1. Score	25% Difenoconazole
2. Tilt-250 EC	25% Propiconazole
3. Dithane M-45	Mancozeb 80% + manganese ethylene
4. Champion	77% Copperhydroxide
5. Cupravit	50% Copperoxychloride
6. Ridomil MZ-72	Metalaxyl 80g a.i/Kg+ Mancozeb 640 g a.i/ Kg
7. Rovral 50 WP	Iprodione 50%
8. Bavistin	Carbendazin 50%

3.6. Botanical Control

Neem Extract (1:5) was used as botanical treatment.

3.7. Experimental Design

The experimental units arranged in Randomized Complete Block Design (RCBD) with three (3) replications. The unit plot size was 2m x 1.5m.

One block is separated from other by 1m and within a block each unit plot separated from each other by 0.5 m.

3.8. Variety Used

The seedlings of a local onion cultivar, Taherpuri collected from Savar Bazar, Dhaka was used in this experiment. Taherpuri is a popular local variety which is commonly cultivated in Savar, Manikgonj, Faridpur and other onion growing areas of the country for its attractive size and shape, demand and higher market price.

3.9. Unit plot and spacing

The unit plot size was 2 m x 1.5 m and experimental plot size was 19.5 x 10.5 m. The row to row and seedling to seedling distance was maintained 20 cm and 15 cm, respectively.

3.10. Date of sowing

Seedlings were planted on 17 December, 2006

3.11. Collection of Treatment materials

Score, Tilt-250 EC, Dithane M-45, Champion, Cupravit, Ridomil MZ-72, Rovral 50 WP, and Bavistin were procured from farm store of Sher-e-Bangla Agricultural University. Neem extract was obtained from Neem leaves collected from Neem plant.

3.12. Preparation of Chemical Suspension/ Solution

At recommended doses suspension/solution of fungicides were prepared by mixing thoroughly with requisite quantity of chemical with normal clean water. It was required 0.5ml Score/ liter of water, 0.5ml Tilt-250 EC/ liter of water, Dithane M-45 4.5g/ liter of water, 2g Champion/ liter

of water, 7g Cupravit/ liter of water, 2 g Ridomil MZ-72/ liter of water, 2 g Rovral 50 WP/ liter of water, and 1g of Bavistin / liter of water for preparation of respective solution.

3.13. Preparation of Neem extract

For extraction of juice, required amount of respective leaves was taken, washed in tap water, crushed in a mortar and pestle. The crushed materials were blended in an electric blender adding equal amount of sterile water for 1:1 solution. The blend was filtered through sterile cheesecloth. The supernatant was diluted for 1:5 solutions.

3.14. Intercultural operations

3.14.1. Irrigation

Irrigation was given as per requirement of the soil with regular intervals. First irrigation was given just after planting. Then irrigation was done with regular interval and continued up to harvesting of the crops. Water cane with perforated mouth piece was used for soft discharged of water. Irrigation was followed the each weeding of the crops.

3.14.2. Weeding and mulching

Weeding and mulching were done as and when required to keep the crop free from weeds and for better soil aeration and conservation of soil moisture. Weeding was done carefully keeping the delicate young plants undisturbed.

3.14.3. Application of Insecticide:

The field was infected by cutwarm and mites. In order to overcome those problem, Diazpum and Actara was applied in recommended dose

3.15. Application of Treatments:

Spraying was started from 20 days after planting. Totally 6 spraying were done at 10 days intervals with a hand sprayer. 1 liter of suspension of each spray material was used to spray the plants under each treatment. A control treatment was maintained in each block where spraying was done with plain water only.

3.16. Isolation and identification of pathogens

Isolation and identification pathogen were made in two ways-

a) By direct observation
b) By inoculating sample tissues on Potato Dextrose Agar (PDA) medium.

3.16.1 By direct observation

The diseased leaves of onion plants were collected and kept in polythene bags and tagged. The samples were then taken to the laboratory. Then slides were prepared from the diseased samples, observed under microscope and identified the pathogen according to CMI Description.

3.16.2 By growing on potato dextrose agar (PDA) medium

The diseased leaves were cut into pieces (4mm diameter) and surface sterilized with $HgCl_2$ (1: 1000) for 30 seconds. Then the cut pieces were washed in sterile water thrice and were placed on to acidified PDA medium in Petridish. The plates containing leaf pieces were incubated at room temperature for seven days. When the fungus grew well and sporulated, the organism was recultured by single spore or tip culture method to obtain pure culture. Then slides were prepared from

pathogenic structures and was observed under microscope and identified with the help of relevant literature (CMI Description).

3.17. Data Collection

Two plants were selected randomly from each row of the unit plot and tagged, thus every row was considered for data collection. In all, 10 plants were considered for data collection for each unit plot. Data collection was started after the onset of the disease and continued up to maturity with 7 days intervals. Data were collected on the following parameters.

3.17.1. Number of infected plant per unit plot

Number of plant infected per unit plot were recorded and used for calculation of disease incidence. The leaf with characteristic spot or blighted tip was denoted as diseased leaf.

3.17.2. Calculation of disease incidence

The percent disease incidence was calculated using the following formula.

$$\text{Disease incidence (\%)} = \frac{\text{No. of infected plant}}{\text{Total no. of inspected plants}} \times 100$$

3.17.3. Leaf area diseased (LAD) per plant

Leaf area diseased of the two selected plants in every row of the unit plot under each treatment were measured and recorded by conversion to

percentage. Mean percentage of leaf area diseased was calculated by dividing number of total observation and used for PDI (Percent disease index) estimation.

3.17.4. Estimation of PDI

The following diseased scoring scale "0 – 5" scale was used to estimate the disease severity (PDI) for each unit plot under each treatment.

0 = no disease symptoms

1 = a few spots towards the tip, covering less than 10% leaf area

2 = several white patches covering less than 20% leaf area

3 = several patches covering up to 40% leaf area

4 = long streaks covering up to 75% leaf area or bricking of leaves/ stems from the centre

5 = complete drying of the leaves/ stems or breaking of the leaves/stems from the base.

The percent disease index (PDI) was calculated using the following formula:

$$PDI = \frac{\text{Total sum of numerical ratings}}{\text{Number of observation} \times \text{Maximum disease rating grade in the scale}} \times 100$$

3.18. Harvesting of Bulbs

Onion bulbs were harvested on 1 April, 2007 at which most of the leaves had been turned yellow. The bulbs were collected by cutting stalks 1 cm

above from it. Then it was spreading under shade for drying and cleaning was done. Later weight of bulbs for each unit plot under each treatment was taken separately and recorded.

3.19. Yield per plot

Bulb yield of onion per plot were recorded individually by digital balance.

3.20. Analysis of Data

Data were analysed statistically using MSTAT Computer Program. Data were transformed, following Arcsine transformation whenever necessary. Means were compared using Duncan's Multiple Range Test (DMRT).

CHAPTER 4

RESULTS

Effect of the treatments in management of Stemphylium blight of onion caused by *Stemphylium vesicarium* was assessed based on the result of percent plant infection, percent leaf area diseased (LAD), percent disease index (PDI) and bulb yield (Table 4.1- 4.4, figs .4.1 – 4.4).

4.1. Percent plant infection

Results obtained on the effect of spray of Score, Tilt, Dithane M- 45, Champion, Cupravit, Ridomil, Rovral 50 WP, Bavistin and Neem extract in controlling stemphylium blight of onion in terms of plant infection was presented in Table 4.1 and Fig-4.1. The effects were differed significantly among the treatments with some extents. The lowest plant infection (36.66%) was observed with the spraying of Rovral applied at 10 days interval followed by Dithane M-45 (40.00%), Neem extract (43.33%), Score (53.33%), Ridomil (56.66%), Bavistin (56.66%), Champion (60.00%), Cupravit (63.33%) and Tilt- 250 EC (66.66%).

Table 4.1. Effect of fungicides on the disease incidence of stemphylium blight of onion

Treatment	%Plant infection*
Score	53.33 f
Tilt	66.66 b
Dithane M-45	40.00 h
Champion	60.00 d
Cupravit	63.33 c
Ridomil	56.66 e
Rovral	**36.66 i**
Bavistin	56.66 e
Neem extract	43.33 g
Control	73.33 a
Level of significance	0.01
LSD	2.371
CV (%)	2.51

* Average of 5 observations taken on 7 days interval.

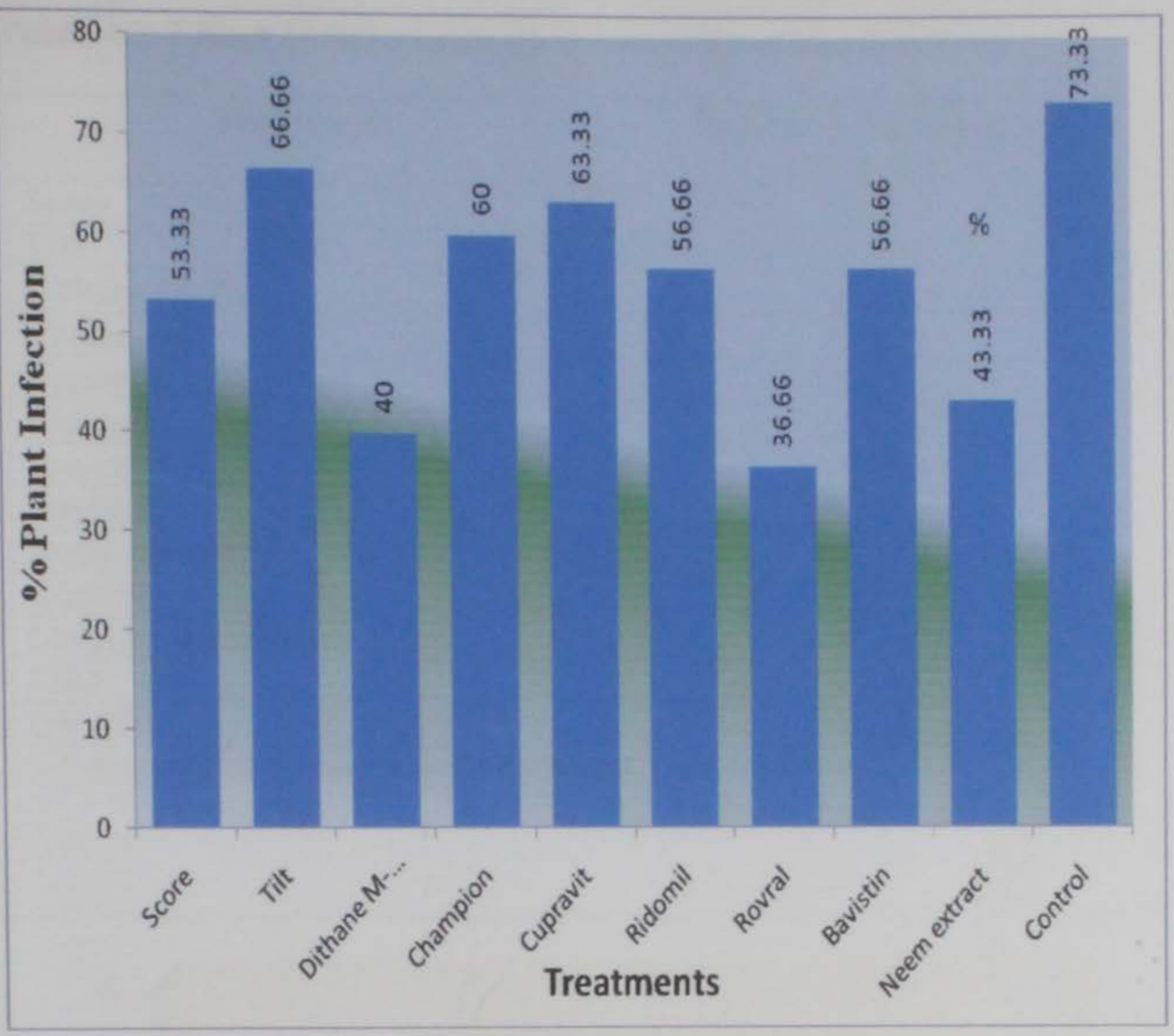

Fig. 4.1 Showing % plant infection as affected by different treatments

4.2. % Leaf Area Diseased

Rovral, showed the best performance (13.93%) in minimizing % leaf area diseased of stemphylium blight of onion which was followed by Dilthane M-45 (14.21%), Neem extract (14.76%), Score (17.37%), Ridomil (18.21%), Bavistin (19.33%), Champion (20.67%), Cupravit (21.43%) and Tilt- 250 EC (23.78%). Significantly the highest % LAD (29.76) was observed under control treatment where only plain water was sprayed (Table-4.2, Fig.4.2).

Table 4.2. Effect of fungicides on the severity of the disease

Treatment	% Leaf Area Diseased (% LAD)*
Score	17.37 d
Tilt	23.78 b
Dithane M-45	14.21 e
Champion	20.67 c
Cupravit	21.43 c
Ridomil	18.21 d
Rovral	**13.93 e**
Bavistin	19.33 cd
Neem extract	14.76 e
Control	29.76 a
Level of significance	0.01
LSD	2.237
CV (%)	6.74

* Average of 5 observations taken on 7 days interval.

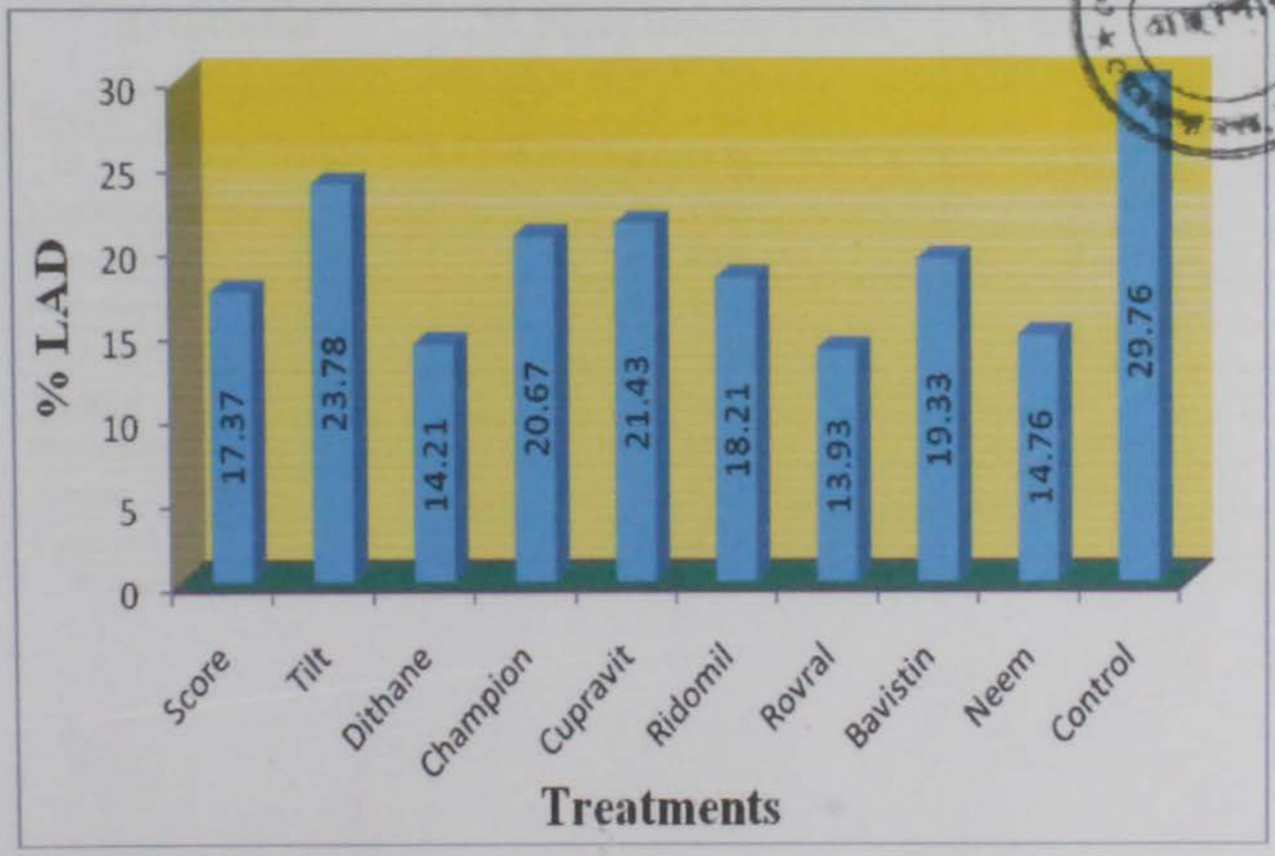

Fig. 4.2 Showing % severity of disease due to different treatments

4.3 Percent Disease Index (PDI)

Rovral showed the highest performance (32.66%) among the fungicides in reducing PDI of stemphylium blight of onion followed by Dithane M-45 (33.15%), Neem extract (33.83%), Score (35.21%), Ridomil (37.43%), Bavistin (37.95%), Champion (41.25%), Cupravit (42.17%), Tilt- 250 EC (43.33 %).

Among the fungicides Tilt, Cupravit and Champion appeared as the least effective and yielded the maximum PDI value of the disease numerically and were statistically identical in comparison to control (Table- 4.3, Fig. 4.3).

Table 4.3 Effect of fungicides on the severity of disease

Treatment	% Plant Disease Index (% PDI)*	% reduction of PDI over control
Score	35.21d	33.95
Tilt	43.33 b	18.72
Dithane M-45	33.15e	37.82
Champion	41.25c	22.62
Cupravit	42.17c	20.89
Ridomil	37.43d	29.79
Rovral	**32.66e**	38.73
Bavistin	37.95d	28.81
Neem Extract	33.83e	36.54
Control	53.31a	

* Average of 5 observations taken on 7 days interval.

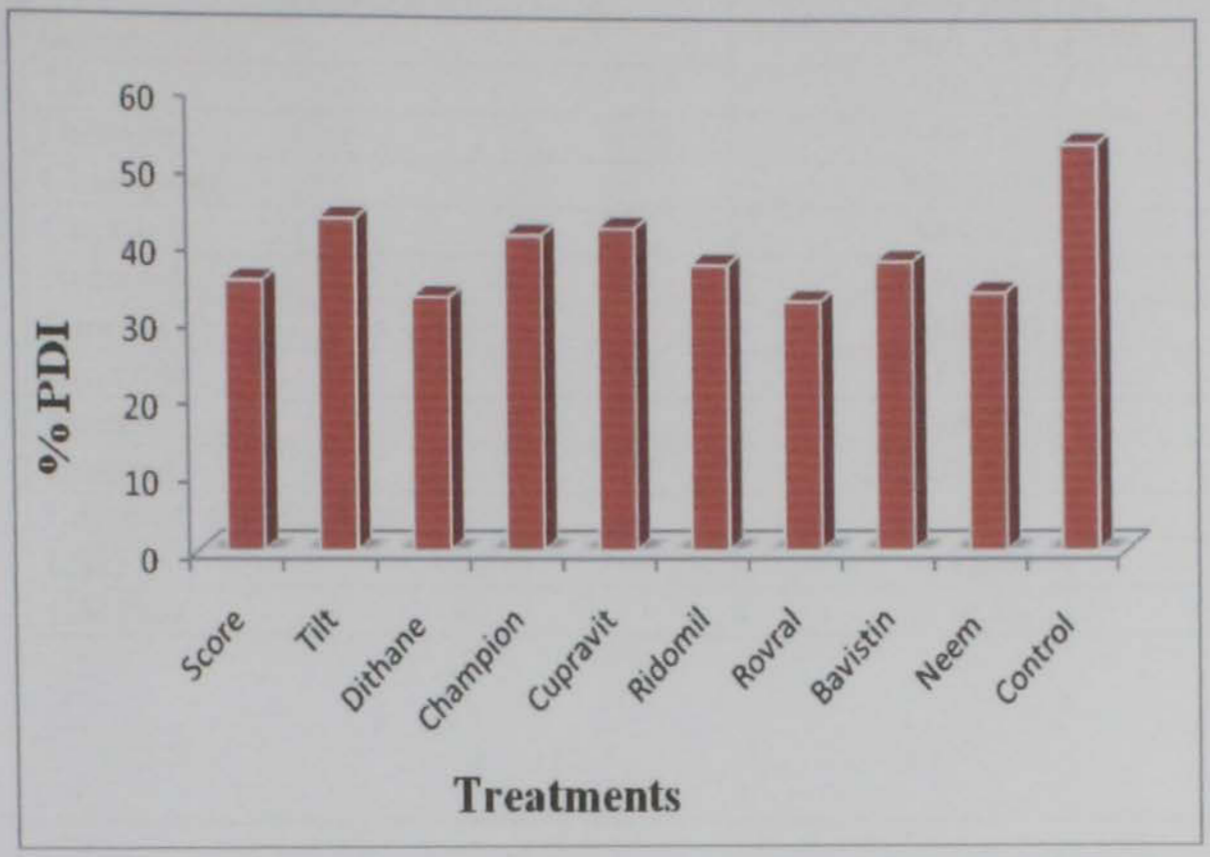

Fig. 4.3. Showing disease severity of onion due to different treatments

4.4 Yield/plot

Regarding onion bulb yield, the highest yield 750.4 g per unit plot was recorded in case of Rovral followed by that of Dithane M-45 which scored the second highest bulb yield 730.18 g per unit plot. The results showed that the lowest yield was observed in case of Control (501.8g) (Table4.4, Fig.4.4)

Table 4.4 Effect of different fungicides on the bulb yield of onion

Treatment	Yield/plot (g)
Score	660.243 d
Tilt	578.927 f
Dithane	730.187 b
Champion	608.197 e
Cupravit	588.817 f
Ridomil	650.220 d
Rovral	**750.403 a**
Bavistin	615.113 e
Neem	700.20 c
Control	501.857 g
Level of significance	0.01
LSD	12.91
CV (%)	1.18

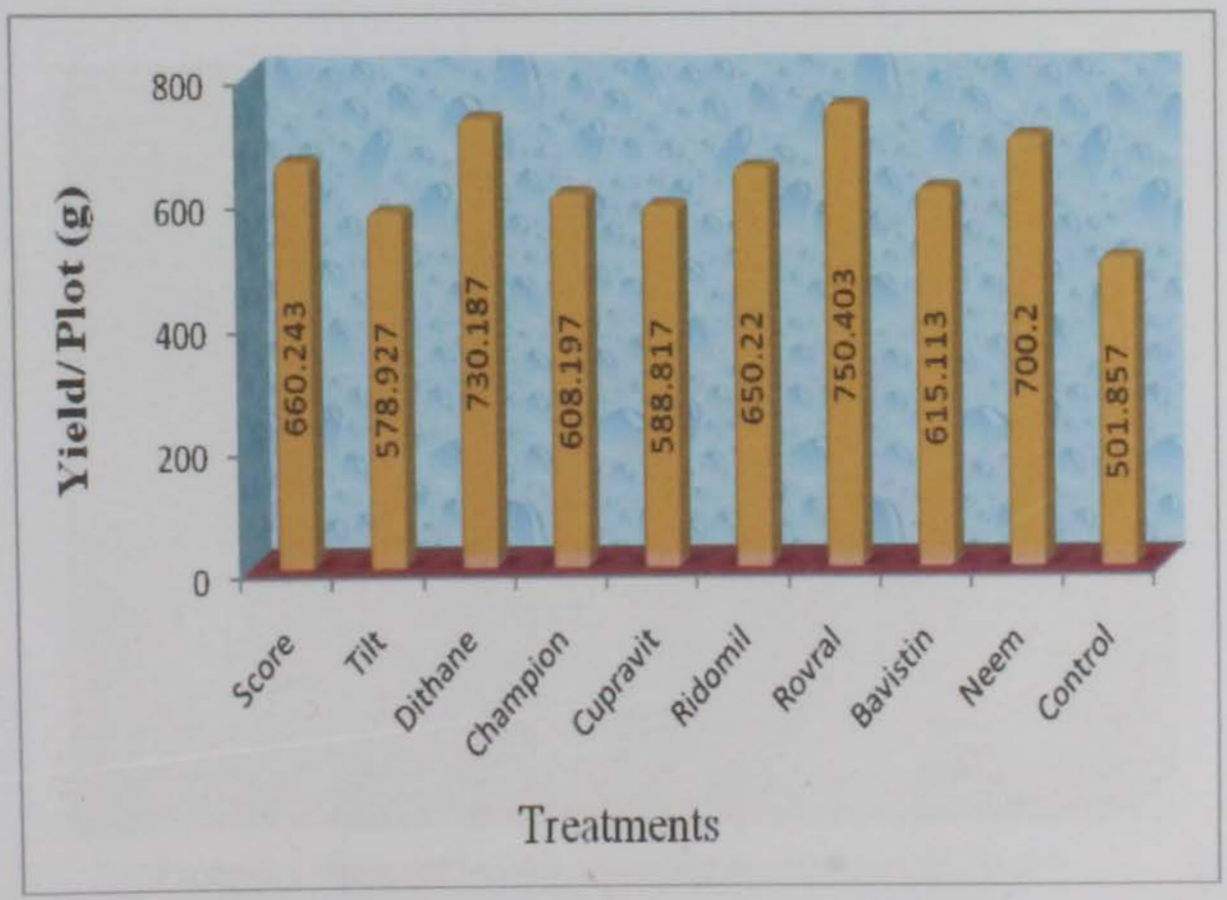

Fig. 4.4. Showing bulb yield of onion due to different treatment

Plate-1 Stemphylum blight of onion caused by *Stemphylum vesicarium*

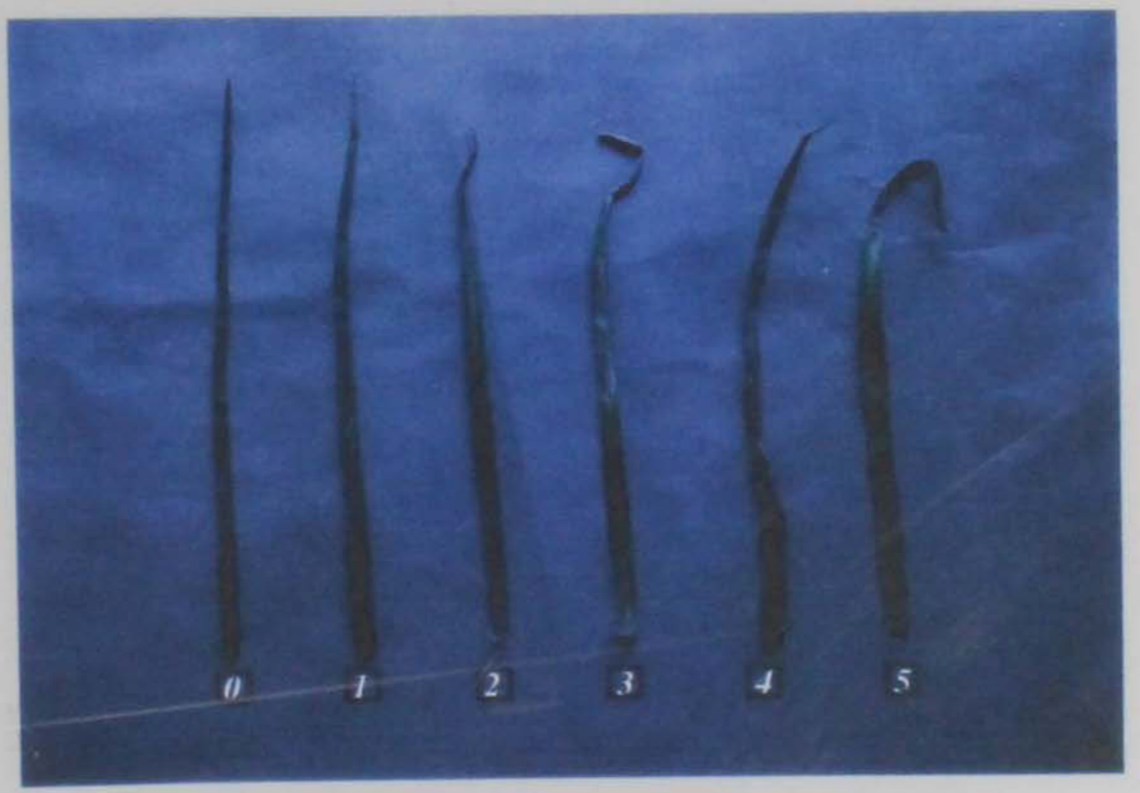

Plate-2 Diseased leaves showing scoring scale "0-5"

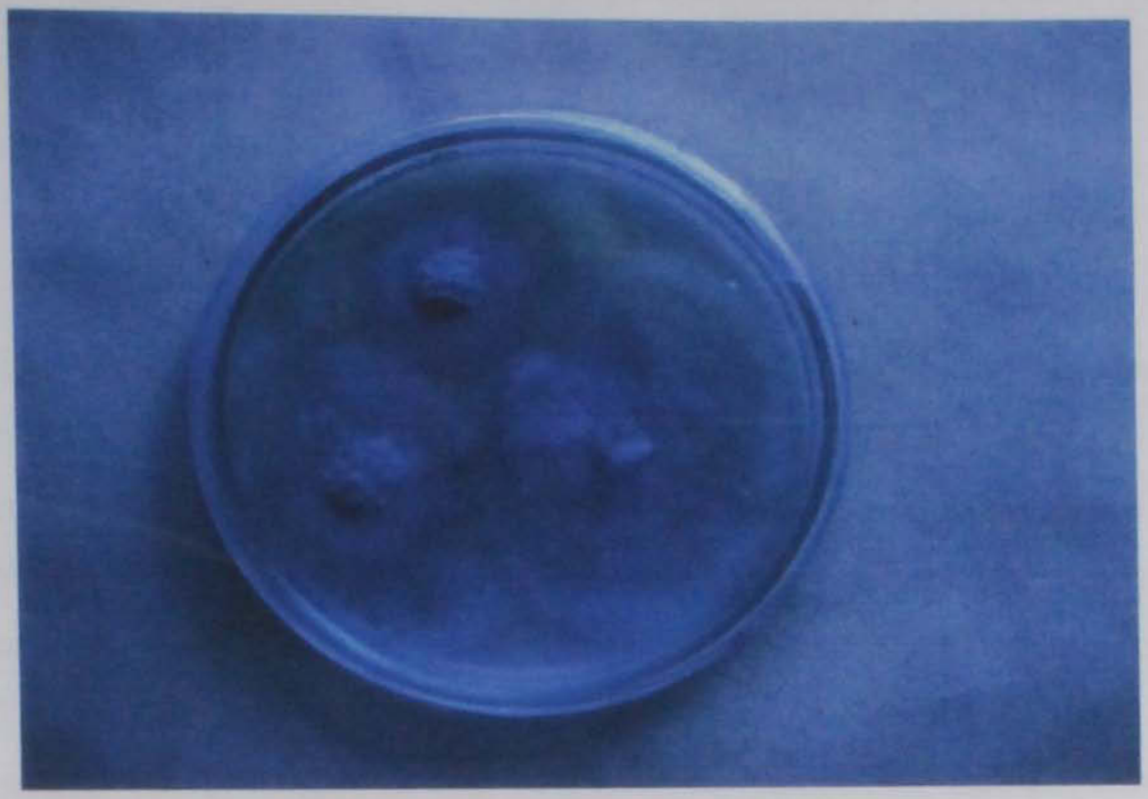

Plate-3 Pure culture of *Stemphylum vesicarium*

Plate-4 Conidia and mycellium of as *Stemphylium vesicarium* observed under compound microscope

CHAPTER 5

DISCUSSION

The effect of the treatments used in the experiment in terms of reducing percent plant infection, percent leaf area diseased and percent disease index increasing bulb yield showed that treatment of onion bulb with Rovral (0.2%) in recommended dose (0.45%) followed by foliar spraying at 10 days intervals performed better in comparison to other treatments. Dithane M-45 (0.45%) and Neem extract (1:5) showed more or less similar performances to that of Rovral in controlling stemphylium blight of onion. The rest of the treatments viz. Score, Tilt, Champion, Cupravit, Ridomil and Bavistin had no remarkable effect in controlling the disease.

This results of the present experiment are supported by the findings of Patil *et al.*, (1976), Barnoczki-stoilova *et al.* (1989), Gupta *et al.*, (1992), Aveling *et al.* (1993), Srivastava *et al.* (1995) and Gupta *et al.* (1996)

It was noticed that the first onset of infection & preliminary diseased development was more or less similar for all treatments but with the spraying of fungicides the disease incidence and severity appeared to be distinct in comparison to control. It indicated the inhibitory effect of the treatment applied. Considering the findings of the present experiment it may be suggested that Rovral @ 0.2% , Dithane M-45 @ 0.45% or Neem extract at 10 days interval to be used for management of stemphylium blight of onion against *Stemphylium vesicarium.*

CHAPTER 6

SUMMARY AND CONCLUSION

An experiment was conducted in the Farm of Sher-e- Bangla Agricultural University, Dhaka, during the period of December, 2006 to April, 2007 to study on the management of stemphylium blight of onion caused by *Stemphylium vesicarium*. The experiment was laid out in the randomized completed block design with three replications. Onion variety Taherpuri was used. Score, Tilt-250 EC (Propiconazole), Dithane M-45 (Mancozeb), Champion, Cupravit (Copper oxichloride), Ridomil MZ-72 (Metalaxyl + Mancozeb), Rovral 50 WP (Iprodione), Bavistin (Carbendazim) and Neem extract were used to explore the possibility of controlling stemphylium blight of onion.

The observations were made on the effect of the treatments on percent plant infection, percent leaf area diseased, percent disease index and bulb yield. The lowest percent plant infection (36.66%) was found in case of foliar spray of Rovral at 10 days interval which was followed by foliar spray of Dithane M-45 at same interval (40.00%). The highest percent leaf infection was recorded in control treatment (73.33%).

The lowest percent leaf area diseased (LAD) was observed in case of foliar spray of Rovral (13.93%) which was followed by foliar spray of Dithane M-45 (14.21%), Neem extract (14.76%), Score (17.37%), Ridomil (18.21%), Bavistin (19.33%), Champion (20.67%), Cupravit (21.43%) and Tilt (23.78%). The highest % LAD was observed under control (29.76%) treatment. Treatments under this experiment were also differed on bulb yield in comparison to control. The bulb yield was recorded highest (750.4g) in foliar spray of Rovral, followed by foliar spray of Dithane M-45 (730.2g). The lowest bulb yield/plot was observed in control (501.9g) treatment.

The highest reduction of Percent Diseasse Index (PDI) was achieved by the application of Rovral (32.66%) followed by Dithane M-45 (33.15%) and Neem extract (33.83%). The rest of the treatments showed moderate effect in reducing PDI.

On the basis of the findings it may be concluded that Rovral M-45 @ 0.45%, as foliar spray at 10 days intervals revealed to be effective for controlling stemphylium blight of onion among the fungicides and plant extract employed in the experiments.

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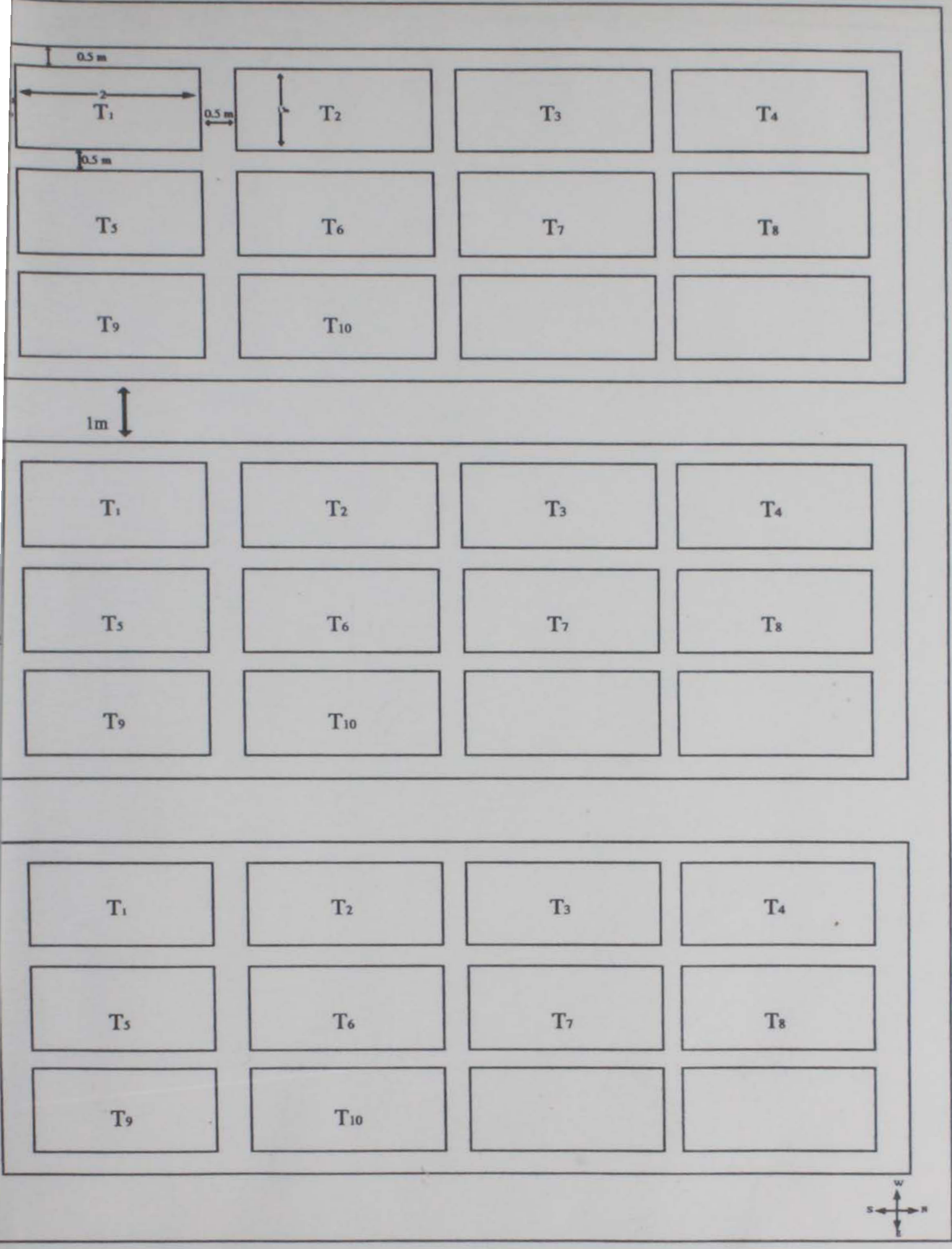
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