Short Communication

Effect of meteorological parameters on growth and sporulation of Alternaria alternata causing Alternaria fruit rot of brinjal

M. S. BOCHALYA, K. S. SHEKHWAT, ANIL KUMAR, RAJENDRA SINGH and P. K. CHOHAN*

Department of Plant Pathology, S. K. N. College of Agriculture, Jobner
Swami Keshwanand Rajasthan Agricultural University, Bikaner, Raj-303329
Department of Plant Pathology, *CCS, HAU-Hisar, Haryana
email: mspatho@gmail.com

Brinjal (Solanum melongena L.) is a major solanaceous vegetable crop of India. It contributes about 12.47 per cent of the total production of vegetables in India. In Rajasthan, it is grown in all districts in an area of 5738 hectares with 37253 metric tonnes production and productivity of 6.49 metric tonnes per hectare (Anonymous, 2007-08). A heavy infection of Alternaria fruit rot of brinjal caused by A. alternata (Fr.) Keissler was observed in the vicinity of Jobner (Jaipur). In India, the disease Alternaria fruit rot of brinjal was first reported from IARI, New Delhi. This disease is severe and appears regularly, causing heavy losses in fruit yield. The disease appear in two phases, leaf spot and fruit rot. The disease first makes its appearance in young seedling during the rainy season (July-August) which is blighted. They give a cherry appearance and finally die out. In September, it attacks on leaves and then spread to fruits which rot and become unfit for consumption. Lesions of fruits are first observed during February. They start as small (above 1/2 cm in size), concentric, dark brown and sunken spots. Colour of the lesions become olivaceous dark brown due to spore formation. Several lesions may coalesce and cover the entire surface of the fruit (Kapoor and Hingorani, 1958). Fungus produces muriform conidia and usually formed in chains (Fig. 1 & 2). To find out the role of environmental factors such as temperature, relative humidity and light/darkness on the disease development, in vitro studies were conducted at Department of Plant Pathology, SKN, College of agriculture, Jobner during 2009-10.

To study the effect of temperature on mycelial growth and sporulation the pathogen, 20 ml of sterilized PDA medium was poured in sterilized Petri-plates. Inoculation was made with 5 mm disc from 7 days old pure fungal culture and incubated at 5 different temperatures viz., 15, 20, 25, 30 and 35°C. Observations were recorded at 4th and 7th days after incubation. Each treatment was replicated four times.

To study the effect of relative humidity on mycelial growth and sporulation, the pathogen on PDA medium was inoculated similar to the previous experiment and incubated at 60, 70, 80, 90 and 100 per cent relative humidity. The different relative humidity levels were maintained by the method suggested by Buxton and Mellanby (1934). Composition of the acid solution used was as follows.

| Relative humidity (%) | Stock solution (ml)* | Distilled water (ml) |
|-----------------------|----------------------|----------------------|
| 60                    | 374.0                | 396.0                |
| 70                    | 348.0                | 510.3                |
| 80                    | 294.0                | 640.0                |
| 90                    | 161.0                | 712.0                |
| 100                   | 0.00                 | Only distilled water |

* 50 % v/v solution of concentrate sulphuric acid

Observations and treatments were similar to the previous experiment.

To study the effect of light / darkness on mycelial growth and sporulation of A. alternata, the fungus was grown in four different growth chambers set at different light/dark cycles viz., 24 hrs light /0 hrs darkness, 16 hrs light/ 8 hrs darkness, 8 hrs light/ 16 hrs darkness, 0 hrs light/ 24 hrs darkness. Observations were recorded at 4th and 7th days after incubation.

The temperature for the radial growth of fungus varied for all treatments. It is evident from the data (Table 1 and Fig. 3) that the pathogen grew at all the temperature i.e. 15, 20, 25, 30, and 35°C both at 4th and 7th days after incubation. Maximum mycelial growth 86.00 mm and excellent sporulation was observed at 25°C. A gradual decrease in mycelial growth and sporulation was observed at 30°C and 35°C. However the temperature 20°C and 30°C favoured good mycelial growth and sporulation of A. alternata but differ significantly from the growth at 25°C. Minimum mycelial growth i.e. 10.00 and 16.00 mm and fair sporulation was observed at 15°C temperature at 4th
December 2012]  Effect of weather parameters fruit fruit rot of brinjal  188

Table 1. Effect of temperature, relative humidity and light/darkness on mycelial growth and sporulation of A. alternata

| S.No. | Temperature (°C) | Mycelial growth (mm)* | Sporulation (mm)* | Relative humidity (%) | Mycelial growth (mm)* | Sporulation (mm)* | Duration of light / darkness | Mycelial growth (mm)* | Sporulation (mm)* |
|-------|-----------------|------------------------|-------------------|-----------------------|-----------------------|-------------------|-----------------------------|------------------------|-------------------|
|       |                 | After 4 days           | After 7 days       |                       |                       |                   |                             |                        |                   |
| 1.    | 15              | 10.00                  | 16.00             | +                     | 60                    | 34.80             | +                           |                         | 24 hrs light / 020.76 |
|       | 20              | 34.42                  | 54.56             | +++                   | 70                    | 46.00             | ++                          |                         | 16 hrs light / 0834.40 |
|       | 25              | 44.52                  | 86.00             | ++++                  | 80                    | 56.28             | +++                         |                         | 08 hrs light / 1648.24 |
|       | 30              | 38.42                  | 62.14             | +++                   | 90                    | 82.40             | +++                         |                         | 0 hrs light / 2456.44  |
|       | 35              | 26.42                  | 30.60             | ++                    | 100                   | 78.42             | +++                         |                         | 0 hrs light / 2456.04  |
|       |                 |                        |                   |                       |                       |                   |                             |                        |                   |
|       |                 |                        |                   |                       |                       |                   |                             |                        |                   |
| SEm+  |                 | 0.21                   | 0.30              |                       |                       | 0.37              |                             |                         | 0.26              |
| CD at 5% |                | 0.65                   | 0.95              |                       |                       | 1.16              |                             |                         | 0.84              |

* Average of four replications; Note: - = Fair, ++ = Good, +++ = Very good, ++++ = Excellent

and 7th days after incubation respectively. The results showed closed proximity with the previous studies by Ma-Guilong et al. (2006) who showed 24°C was the most suitable temperature for mycelial growth and sporulation of A. alternata. Whereas, Singh et al. (2001) and Isra Ram et al. (2007) found 20 to 30°C temperature range was suitable for A. alternata. It can be concluded that 25°C is the optimum temperature for mycelial growth and sporulation of A. alternata.

Effect of relative humidity

All five humidity levels (Table 1 and Fig. 4) induced the mycelial growth and sporulation of A. alternata. Maximum mycelial growth (82.40 mm) and excellent sporulation was recorded at 90 per cent relative humidity closely followed by 100 per cent (78.42 mm and excellent sporulation) relative humidity. A significant decrease in mycelial growth and sporulation was observed at 80 and 70 per cent relative humidity. The results are in close conformity with the observations of Prasad and Roy (1979) who observed maximum growth and sporulation of Alternaria alternata at 90-100 per cent relative humidity. Previous studies showed that the relative humidity more than 90% induced maximum conidial germination (Chen et al., 2000 and Sugha et al., 2002) and sporulation (Ma-Guilong et al., 2006) of A. alternata. It can be concluded from the present studies that high relative humidity favours the mycelial growth and sporulation of the pathogen.

Effect of light / darkness

The maximum mycelial growth (56.44 and 80 per cent) and excellent sporulation was observed in treatment of 24 hrs darkness followed by 08 hrs light / 16 hrs darkness (48.24 and 74.46 per cent respectively) with very good sporulation (Table 1). In vitro studies on different light/darkness cycles revealed that 0 hrs light/24 hrs darkness supported maximum mycelial growth and sporulation of A. alternata. Minimum mycelial growth and sporulation was observed at 24 hrs light/0 hrs darkness. Khandelwal (1974) observed that several members of the genus Alternaria have been reported to be light sensitive. Singh et al. (2001) studied the effect of light/darkness on germination and sporulation of Alternaria tenuissima and observed maximum conidial germination in total darkness followed by 8 hrs light/16 hrs darkness and 16 hrs light/8 hrs darkness, respectively. The results from present studies indicated that fungus grew best in continuous darkness followed by alternate light and darkness.

ACKNOWLEDGEMENTS

We thank Dr. R.G. Jat, Head, Department of Plant Pathology, for providing facilities and Dr. S.C. Jain, Department of Plant Pathology, SKN College of Agriculture for his kind help for critical reading of the manuscript and encouragement.
REFERENCES

Anonymous, (2007-08). Vital Agriculture Statistics. Directorate of Agriculture Rajasthan, Jaipur, pp. 1-2.

Buxton, P.A. and Mellanby, K. (1934). “Measurement and control of humidity”. Bull. Entomol. Res., 25:171-175.

Chen, L.J., Way, Y. and Feng, G.Q. (2000). Study on the germination characteristics of conidia of Alternaria tenuissima. Plant Protec., 26(5):24-25.

Isra, Ram, Jeeva, Ram, Lalit, Chatta, Rameshwar, Dayal and Thakore, B.B.L. (2007). Investigations on Alternaria fruit rot of ber (Ziziphus mauritiana Lam.) and its management by fungicide. J. Econo. Taxono. Bot., 31(3):613-621.

Kapoor, J.N. and Hingorani, M.K. (1958). Alternaria leaf spot and fruit rot of brinjal. Indian J. Agri. Sci., 28:109-114.

Khandelwal, G.L. (1974). Studies on blight disease of cucurbit caused by Alternaria alternata (E. & E.) Elliot. Ph.D. Thesis Submitted to Department of Plant Pathology, University of Udaipur (Udaipur). pp. 55-60.

Ma-Guilong, Wang-Li, Gao-Jie and Hua-Zhifel, (2006). Studies on sporulation conditions of Alternaria alternata in tobacco. J. Jilin Agri. Uni., 28(6):610-612.

Prasad, M.M. and Roy, A.K. (1979). Effect of temperature and humidity on fungal deterioration of two vegetables. National Aca. Sci. Lett., 2(12):439-440.

Singh, S.K., Tuli, L., Singh, U.P. and Prithviraj, B. (2001). Effect of temperature, light/darkness and relative humidity on germination and sporulation of Alternaria tenuissima. Indian Phytopathol., 54:128-130.

Sugha, S.K., Kausal, N., Kumar, S., Kausal, N. and Kumar, S. (2002). Factors affecting development of Phomopsis fruit of brinjal. Indian Phytopathol., 55(1):26-29.

Received : September 2012 ; Accepted : October 2012