Plant Archives Vol. 17 No. 1, 2017 pp. 292-294 *ISSN 0972-5210*

MANAGEMENT OF RUST DISEASE (*RAVENALIA EMBLICAE* SYD.) OF AONLA (*EMBLICA OFFICINALIS* GAERTN.)

Sanjeev Kumar*, Pradip Kumar, Prashant Mishra, Santosh Kumar and Sukhvindar Singh

Department of Plant Pathology, Narendra Deva University of Agriculture & Technology, Narendra Nagar (Kumarganj), Faizabad - 224 229 (U.P.), India.

Abstract

Indian goosberry (*Emblica officinalis* Gaertn) commonly known as aonla is one of the important fruit crop in arid and semi-arid growing regions. To test the effect of bioagents and fungicide alone and in combination against aonla rust, a field experiment was conducted at Main Experimental Station Horticulture, Narendra Deva University of Agriculture and Technology, Faizabad during 2010-2013. The result showed that minimum PDI (9.16) with maximum PDC (74.25) and yield 104.75 kg/tree was recorded with (0.2%) chlorothalonil treatment followed by 1% *T. viride* + 0.1% chlorothalonil (14.40 PDI), (59.52 PDC) and yield 91.31 kg/tree. Bio-agents *Trichoderma viride* & *Pseudomonas fluorescens* were found less effective to control the disease.

Key words : *Emblica officinalis*, aonla, *Ravenalia emblicae,* rust, fungicide, bioagents.

Introduction

Aonla (*Emblica officinalis* Gaertn) is an important indigenous fruit of India. The commercial cultivation of aonla is expended from the "Home Land" of Uttar Pradesh to almost all the states of India including Maharashtra, Gujarat, Rajasthan, Madhya Pradesh, Jharkhand, Chhattisgarh and Andhra Pradesh. Among the diseases, aonla rust (*Ravenalia emblicae*) is a serious and economically important disease not only in Uttar Pradesh but also in other states like Rajasthan, Andhra Pradesh, Tamil Nadu, Haryana etc. It was first observed in Rajasthan by Tyagi (1967). In India, Rawal (1993) has observed that this causes considerable loss in major aonla growing tracts of Uttar Pradesh, India. The disease is characterized by appearance of brown pustules on lower side of older leaves of new graft which are brown, circular and raised. On fruits, initial few brown to black pustules appear which develop in the ring. At later stage pustules join together and cover big area of the fruits (Tyagi and Pathak, 1988; Jat and Goyal, 2004). Plants with a severe attack on fruits show no symptoms on the leaves and vice-versa (Tyagi, 1967). Owing to expansion of aonla orchards, working out of management strategies is also equally important to sustain the yield and quality of aonla fruits and hence the present study was conducted to the effect of environment, test of different bio-agents, fungicide alone and in combination with following objectives.

- Symptomatological study under natural condition
- Management with fungicide and bio-agents

Author for correspondence : E-mail: drsanjeev44@gmail.com

Materials and Methods

A field experiment was conducted on cultivar Chakaiya at Main Experimental Station, Horticulture, Narendra Deva University of Agriculture & Technology, Faizabad in Randomized Block Design with three replications during the year 2010-2013. For the management of aonla rust with fungicide and bio-agents, ($\mathbf{T_1}$ = 1% *P. fluorescens,* $\mathbf{T_2}$ = 1% *P. fluorescens* 1% + 0.1% Chlorothalonil, $\mathbf{T_3}$ = 1% *T. viride*, $\mathbf{T_4}$ = 1% *T. viride* + 0.1% Chlorothalonil, $\mathbf{T_5}$ = 0.1% Chlorothalonil, $\mathbf{T_6}$ = 0.2% Chlorothalonil, $\mathbf{T_7}$ = Unsprayed) one tree per replication were maintained for each treatment. Three foliar applications were given at 15 days intervals first spray was done just after initiation of disease. The data on the development of rust on aonla fruits were recorded on the four marked fruiting branches per plant. Disease fruits were graded into six categories of disease incidence *i.e.* 0 = healthy, 1 = 1-10, 2 = 10.1-25, 3 = 25.1-50, 4 = 50.1-75, 5 = >75%. The percent disease index (PDI) and percent disease control (PDC) were recorded

according to following formula.

$$PDI = \frac{\text{Sum of numerical ratings}}{\text{Total number of fruit examined} \times \text{hightst rating}} \times 100$$

$$PDI = \frac{\text{\% disease control} - \text{\% disease in treatment}}{\text{\% disease control}} \times 100$$

(Mckinney, 1923).

Results and Discussion

Rust symptoms first observed on lower side of older leaves of new grafts which are brown, circular and raised during 2nd fort night of October. On fruits, initial few brown to black pustules appear which develop in the ring. At later stage pustules join together and cover big area of the fruit and give dirty look. The black spores are exposed after rupturing a papery covering affected fruit drop before maturity. On leaves, pinkish brown pustules develop, which may be arranged in the groups or scattered as isolated pustule. Pandey *et al*. (2006) observed disease symptoms on fruit first time in the season during 1st fort night of October in both the years. On fruits, initial few brown to black pustules appear which late develop in the ring. At later stage pustules join together and cover big area of the fruit and give dirty look. The black spores are exposed after rupturing a papery covering affected fruit drop before maturity. Plants with a severe attack on fruits show no symptoms on the leaves and vice-versa. Which is contradictory to the result of Tyagi (1967), Nirwan (1969) and Chandawat (1990).

Some workers examined that disease intensity was 18.6% in Mancozeb treatment as against 52.4% in the control. This was followed by Chlorothalonil (0.2%) and Copper oxychloride (0.4%), which recorded 21.4% and 24.3% disease intensity, respectively. The second year confirmation trial showed that PDI was low in treatment chlorothalonil (13.6) followed by copper oxychloride (17.3) Mancozeb (19.6). In the case of *T. viride* (34.7), *Pseudomonas fluorescence* (27.7) and untreated plot showed (41.7) (Gomathinayagam *et al*., 2008).

To management the rust disease a well-established fungicide Chlorothalonil and two bio-agents namely *Trichoderma virde* and *Pseudomonas fluorescens* were used alone and in combination. Spray of Chlorothalonil

Table 1 : Effect of different bio-agents and fungicide against aonla rust (cv. Chakaiya).

S. no.	Treatments	PDI	PDC	Yield (kg/tree)
1	*Pseudomonas fluorescens*	27.75	22.00	79.50
2	*Pseudomonas fluorescens* 1% + 0.1% Chlorothalonil	15.46	56.54	89.00
3	*Trichoderma viride* 1%	22.26	37.43	86.50
4	*Trichoderma viride* 1% + 0.1% Chlorothalonil	13.17	62.98	97.06
5	0.1% Chlorothalonil	14.40	59.52	91.31
6	0.2% Chlorothalonil	9.16	74.25	104.75
7	Water spray (check)	35.58	00	58.88
C.D. at 5%		0.55		1.14

Results of management table reveal that minimum PDI (9.16) with maximum PDC (74.25) and yield 104.75 kg/tree was recorded with 0.2% Chlorothalonil treatment followed by 1% *T. viride* + 0.1% Chlorothalonil PDI (14.40), PDC (59.52) and yield 91.31 kg/tree Bio-agents *Trichoderma viride* & *Pseudomonas fluorescens* were found less effective to control the disease. Similar observations were also recorded by Jat *et al.* (2013) and Theradimani *et al*. (2002-03). Aonla (*Emblica officinalis*) is an important fruit crop known to suffer from a wide range of diseases caused by fungi and bacteria. Among the fungal disease rust is more severe, affecting the crop and its yield. The disease attacks on leaves and fruits. On leaves rust appears as circular or semi-circular, reddish solitary or gregarious spots. Rust pustules become brown circular and raised at initial stage. @ 0.2% reduced the disease upto 74.25 per cent and gave yield 104.75 kg/tree whereas bio-agents were found less effective in comparison to fungicide. Similar observations were also recorded by Jat *et al*. (2004) and Theradimani *et al*. (2002).

References

Jat, R. G., S. K. Goyal and R. P. Didel (2004). Management of aonla rust incited by *Ravenalia emblicae* var. *fruticolae* Syd. *Asian J. Bio. Sci*., **8**(**1**) : 117-119.

Mckinney, H. K. (1923). Influence of soil temperature and moisture on infection of wheat seedlings by *Helminthosporium sativum*. *J. Agric. R*., **26** : 195-218.

Nirwan, R. S., J. Upadhyay and B. Prasad (1969). Aonla rust and its control. *Hort. advance*, **8** : 1-3.

Pandey, S., A. K. Singh and A. K. Singh (2007). Effect of weather

parameters on aonla rust (*Ravenalia emblicae* Syd.). *Indian Phytopath*, **61(3)** : 412.

Rawal, R. D. **(**1993). Fungal disease of tropical fruits spp. In : K. L. Chaddha and O. P. Pareek (Eds.). *Advances in Horticulture, fruit crops*, Vol. **3** Malhotra Publ. House, New Delhi, pp. 1255-1273.

Thiradimani, M., S. J. Hepziba and K. Siddeswarn (2002). Management of aonla rust (*Ravenelia emblicae*) using fungicides and biocontrol agents. *Indian J. Arid Hort.*, **1(1)** : 61-62.

Tyagi, R. N. S. and A. K. Pathak (1988). Control of aonla (*Emblica officinalis* Gaertn.) rust (*Ravenelia emblicae* Syd.) through fungicides. *J. Mycol. Pl. Pathol.*, **17** : 218-219.

Tyagi, R. N. S. (1967). Morphological and taxonomical studies on the genus *Ravenelia berk.* occurring in Rajasthan. *Ph.D. Thesis,* University of Rajasthan, Jaipur.