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USING OIL CAKES INTEGRATION FOR DISEASE MANAGEMENT AND INCREASE IN YIELD OF ONION (*ALLIUM CEPA* L.)

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ABSTRACT

Field experiment was conducted to assess the integration of oil cakes on severity of basal rot (*Fusarium oxysporum*) and leaf spot and blight (*Alternaria alternata*) diseases, and yield of onion. Incidence of basal rot of onion bulb 100% control with significant increases in yield in treatments where soil amendment with mustard oil cake (2 tons / ha.) 15 days prior of seed sowing together with soil drenching with 10% mustard cake extract twice after fruit setting to maturity (T_2, T_4 and T_6). The lowest Percent Disease Index (6 – 8) of *Alternaria* spot and blight was recorded in treatments where foliar spray of 10% neem cake extract on 30 and 60 days of transplanting was carried out (T_4 and T_5).

Key words: Onion, *Fusarium oxysporum, Alternaria alternate,* oil cakes integration.

INTRODUCTION

Onion (*Allium cepa* L.) is one of the important condiments widely used in all households through the year. Onion is commercially grown on an area of 131.4 thousand Hatares with the production of 1.8 million tonnes. The major onion growing districts of Pakistan are Chaghi, Hyderabad, Sanghar, Swat, Kharan, Kalat, Mirpurkhas, Nawabshah, Nasirabad and Dir contributing more than 59% of total production. The world total production of onion was 86.34 million tonnes and Pakistan occupies 8th position with 2.25% share (FAO, 2011). Pakistan produced about 1.94 million tonnes during 2011. The average yield of onion in the country is 13.6 t/ha. In Pakistan the common onion varieties are Desi Red, Sariab, Surkh, Chiltan-89, Swat-1 and Phulkara.

Onions are attacked by large number of insect's pest and diseases viz., pink rot, *Fusarium* basal rot, *Botrytis* neck rot, *Botrytis* leaf blight, purple blotch, *Stemphylium* leaf blight, downy mildew, bacterial streak and soft rot. These are controlled by fungicides. Onion also attached by insects viz., cutworm, wireworm, thrips, and seed corn maggot controlled by insecticides. Weeds are the biggest problem of onion and may be controlled by crop rotation, hand weeding and weedicides. It has been estimated that more than 25% yield losses occur due to foliar diseases, especially *Stemphylium* blight (*S. vesicarium*) and purple blotch (*Alternaria porri*). Onion crop also suffers from basal rot (*Fusarium oxysporum*) and white rot (*Sclerotium rolfsii*) diseases causing various extents of losses (Entwistle, 1990). About 30-40% storage losses in onion occur due to incidence of *Fusarium* basal rot (Gupta *et al*., 2008; Barnoczkine, 1986). The fungal bulb rot imparts to about 15-30 % losses during storage due to diverse fungal pathogen species like *Aspergillus*, *Penicillium*, *Alternaria*, *Fusarium*, *Rhizopus*, *Colletotrichum*, *Pseudomonas*. *Lactobacillus*, *Erwinia* and *Botrytis*. *Aspergillus niger* is the most virulent fungal pathogen in the field and during the post harvest storage (Kumar *et al*., 2015). Gupta *et al*., (2011) conducted study for the management of soil borne fungal pathogens like *Fusarium oxysporum* and *Sclerotium cepivorum* using bio agents and oil cakes. In view of the above facts, the present study was undertaken to control severity of soil borne and foliar diseases, and to increase yield of onion by using oil cakes integration.

MATERIALS AND METHODS

The experiment was conducted during October- March, 2014- 2015 and 2015-16 in experimental fields of Crop Diseases Research Institute, Pakistan Agricultural Research Council, Karachi, Pakistan. The field was prepared and divided into 2.5 m x 1.5 m unit plots having 6 rows and 25 cm space in rows. The experiment was laid out in a randomized complete block design with 3 replications. Well-rotten farmyard manure @ 10 tons per acre was ploughed down one month before land preparation. Seven weeks old onion seedlings of variety Nisarpuri were transplanted at 10 cm plant-to-plant spacing and 25 cm apart in rows. Treatment comprises of amendment of mustard cake @2 tons per Hatare prior two week transplanting, soil drenching with10% neem and mustard cake extract twice after fruit setting to maturity and spraying of 10% mustard and neem cake extract after 30 and 60 days of transplanting. There were 8 treatments as follows:

T_1 = A
T_2 = A+ B
T_3 = A+ C
T_4 = A+B+D
T_5 = A+C+D
T_6 = A+B+E
T_7 = A+C+E
T_8 = Control (Untreated)
A = Soil amendment with mustard oil cake (2 tons/ Ha.) 15 days prior of seed sowing.
B = Soil drenching with10% mustard cake extract twice after fruit setting to maturity.
C = Soil drenching with 10% neem cake extract twice after fruit setting to maturity.
D = Foliar spraying with 10% neem cake extract 30 and 60 days of transplanting.
E = Foliar spraying with 10% mustard cake extract after 30 and 60 days of transplanting.

Data on plant height and yield parameters were taken. The incidence of basal rot of bulbs was recorded after harvesting. The intensity of foliar spot and blight caused by *Alternaria alternate* were recorded 30 days after transplanting till maturity on a 0–9 scale (TNAU, 1980) and Percent Disease Index (PDI) was computed (Mckinney, 1923). The data recorded in two consecutive years were pooled and statistical analysis was done to compare different treatments combinations using Duncan multiple range test and compared means by using SPSS version 19.

RESULTS AND DISCUSSION

Data presented in Table 1 revealed that incidence of basal rot of onion bulb was cent per cent controlled in treatments where soil amendment with mustard oil cake (2 tons/ Ha.) 15 days prior of seed sowing together with soil drenching with10% mustard cake extract twice after fruit setting to maturity were used (T_2, T_4 and T_6). This is followed by treatments where soil amendment with mustard oil cake (2 tons/ Ha.) 15 days prior of seed sowing together with soil drenching with10% neem cake extract twice instead mustard cake after fruit setting to maturity where soil amendment with mustard oil cake (2 tons/ Ha.) 15 days prior of seed sowing together with soil drenching with10% neem cake extract twice after fruit setting to maturity (T_3, T_5 and T_7). The basal rot was noted 3.76 % in treatment (T_1) where only soil amendment with mustard oil cake (2 tons/ Ha.) 15 days prior of seed sowing were used as compared to 6.67% recorded in untreated control (T_8).

Table 1. Effect of oil cakes on diseases, plant height and yield (pooled data of Rabi, 2014-15 and 2015-16).

Treatments	Disease Incidence		Yield (Kg/ ha)
	Basal rot (%)	Foliar blight (PDI)	
T_1	3.76_{d}	19.55_{c}	5071.87_{e}
T_2	0.00_{a}	20.55_{c}	7471.87_{a}
T_3	2.16_{c}	22.33_{d}	6671.87_{c}
T_4	0.00_{a}	06.00_{a}	7071.87_{b}
T_5	1.86_{b}	08.00_{a}	6071.87_{d}
T_6	0.00_{a}	13.00_{b}	7671.37_{a}
T_7	1.96_{b}	15.00_{b}	6971.87_{b}
T_8	6.76_{e}	22.55_{d}	4871.87_{f}

Mean followed by the same letter within a column are not significantly different at (P = 0.05) according to Duncan's multiple range test.

All the treatment comprising foliar spray significantly reduced intensity of foliar spot and blight caused by *Alternaria alternata* over other treatments and control. The lowest Percent Disease Index (PDI) of *Alternaria* spot and blight was 6 – 8 was recorded in treatments comprises of foliar spray with 10% neem cake extract 30 and 60

days of transplanting (T_4 and T_5). This is followed by the treatments (T_6 and T_7) where foliar sprays with 10% mustard cake extract 30 and 60 days of transplanting hiring 13– 15 PDI as compared to 22.55 PDI in untreated control (T_8). The present study was supported by Ramgegathesh *et al*. (2011) that spraying of neem oil was the most effective among other plant products for control of onion leaf blight disease caused by *Alternaria alternate*. A similar result was reported that neem oil reduced the leaf blight disease of onion caused by *Alternaria plandui* in field condition (Karthikeyan *et al*., 2006). There is report that neem seed extract and oil widely used to control the insect and pathogens because of active ingredient Azadiractin (Mordue and Nisbet, 2002).

The present study revealed that use of oil cakes and its extracts in combination are effective to increase yield as well as reduced the incidence of disease of onion. The significant increases in yield was noticed in treatments where soil amendment with mustard oil cake (2 tons/ Ha.) 15 days prior of seed sowing together with soil drenching with10% mustard cake extract twice after fruit setting to maturity. Gupta *et al*. (2009) have reported that the favourable nutritional environment in the root zone created by the addition of organic manures and biofertilizers resulted in increased absorption of the nutrients from soil which was responsible for increasing the yield of onion bulbs. Integration of chemical fertilizers along with organic manures crop improved the quality and yield of onion bulbs (Singh *et al*., 2001).

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