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EFFECT OF FUNGICIDES ON MANAGEMENT OF FUNGAL BULB ROT IN CLUSTER ONION

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EXTENDED ABSTRACT

Onion (*Allium cepa* L.) is one of the important condiment and cash crop grown in Sri Lanka. The average yield of cluster onion in Sri Lanka ranged from 11 to 15 t/ha. It has been reported that there are several factors affect the yield of cluster onion. Among them, occurrence of fungal bulb rot is the key factor that effect on yield losses of cluster onion in the field. The disease is caused by several soil borne pathogens such as *Fusarium* spp. (Szczech, 1999), *Pythium* spp. (Veeken *et al.,* 2005), *Rhizoctonia solani* (Diab *et al.,* 2003), *Sclerotium* spp. (Coventry *et al.,* 2005). Make use of Homai (Thiophanate methyl 50% + Thiram 30% WP) at the rate of 18 g/10 l or Thiram 80% WP at the rate of 15 g/10 l water for 30 min or Thiophanate-methyl 70% WP at the rate of 20 g/10 l water for 30 min as a bulb treatment at planting is recommended by the Department of Agriculture in Sri Lanka (Pesticide Recommendations, 2015). Meanwhile, adding cow-dung at the rate of 15- 20 t/ha at land preparation showed the low fungal bulb rot incidences in DL_{2b} agro ecological zone in Sri Lanka (Fernando *et al.,* 2013).

The present study was undertaken to investigate the efficacy of three recommended fungicides and two fungicides which are not recommended for controlling fungal bulb rot, by *in vitro* and field screening in major cluster onion growing agro-ecological regions of Sri Lanka, namely, DL_{2b} and DL_3. The main causal agents of onion bulb rot in DL_{2b} region i.e. *Fusarium* spp. and *Sclerotium rolfsii* were isolated from soil of onion cultivations. This study was conducted to identify suitable fungicides and dipping time of bulbs in fungicide solution for controlling fungal bulb rot in different treatment durations which give the lowest disease incidence with high yields in cluster onion. Field study was conducted at the Regional Agriculture Research and Development Centre (RARDC), Aralaganwila and Agriculture Research Station (ARS), Thirunelvely, two of the main cluster onion growing areas of Sri Lanka.

A laboratory screening study was conducted in *Yala* 2012 season. The main pathogens which are common in research fields were *Fusarium* spp. and *Sclerotium rolfsii.* Therefore, isolates of *Fusarium* spp. and *Sclerotium rolfsii* from soils of research fields were used for the experiment. Five fungicides which are commonly used in cluster onion cultivations were tested with three replicates in a Complete Random Design (CRD). Those treatments were as Captan 50% WP, 10g/10l (T1), Thiram 80%WP, 15g/10l (T2), Tizca (Fluazinam 500g/l SC), 5ml/10l (T3), Homai (Thiophanate methyl 50% + Thiram 30% WP), 18g/10l (T4), Orius (Tebuconazole 250 ml/l), 3.5 ml/10l (T5). Among the selected fungicides, Captan WP, Thiram WP and Homai WP are recommended fungicides for bulb treatments and others i.e. Fluazinam SC and Tebuconazole are recommended for foliar diseases. Fungicide screening test (*in-vitro*) was conducted by following food poison technique. The diameters of colonies were measured after 3, 5, and 7 days of the experiment. Then, the mean growth rates of each fungus were calculated. Antifungal Activity Calculation were done with five mm disc from an actively growing culture of each fungi were separately placed in the center of Potato Dextrose Agar (PDA) plate mixed with fungicides. Three replicate plates were used per treatment. Percentage of inhibition was calculated.

Field studies were conducted during *Yala* 2012 and *Maha* 2012/13 seasons as a field trail at the RARC Aralaganwila (DL_{2b} agro-ecological region) and ARS Thirunelvely (DL_3 agro-ecological region) to find out the appropriate combination of fungicides and the bulb treatment time to reduce the fungal bulb rot disease in onion. The experiment plots at Aralaganwila were at a site of the regular cultivation of cluster onion and infected plants, crop residue were also added (Sick plot). Twenty five treatments were tested as combination treatments including five fungicides and five bulb treatment times. Treatments were replicated three times and arranged as a Randomized Complete Block Design (RCBD) at each location and each growing season. Data were recorded on disease incidence (%) by counting total number of plants and diseased plants at weekly intervals since planting up to harvesting. Percent disease incidence (DI %) was calculated.

In vitro screening revealed that there is a significant difference among the fungicides tested ($p < 0.0001$). The lowest growth rate was shown in culture plates treated with Captan 10g/ 10l for both *Fusarium* spp. and *Sclerotium rolfsii.* Homai also showed a similar growth rate as with Captan. Homai is widely used recommended fungicide to the fungal bulb rot in cluster onion cultivations in Sri Lanka. Thiophanate – methyl is highly effective on *Fusarium* spp. and *Sclerotium rolfsii* (Pesticide Recommendations, 2015). However, Tizca and Orius did not show effective control on tested fungi and it may be

due to they are mainly meant for controlling foliar diseases. Relative inhibition of colony growth results showed that both fungi have significantly better colony growth inhibition in Captan 50% WP and Homai (Thiophanate methyl 50% + Thiram 30% WP) compared to other tested fungicides. Captan 50% WP, a more efficient fungicide resulted in 89.4 % and 90.7% reduction of *Fusarium* spp. and *Sclerotium rolfsii* growth, respectively. Homai also showed a similar efficiency with 72.7% and 74.9% reduction with respective fungi. There are significant differences in Homai (Thiophanate methyl 50% + Thiram 30% WP) and Captan 50% WP with Thiram in *In- vitro* and *In- vivo* experiments. In both seasons at Thirunelvely there were less than 5% disease incidence level may be due to low pathogen density in that soil under natural infection conditions.

It shows that the fungal bulb rot was not a serious disease under DL_3 climate conditions in both seasons tested. But, in Aralaganwila the disease incidences were comparatively high. It is logical to assume that disease presence and its potential impact on crop would be greater in Aralaganwila than Thirunelvely as the latter does not maintain a sick plot for the disease. Thus, more cluster onion crop residues on soil of sick plot is likely to act as an inoculums source to potentially contribute to high disease infection at Aralaganwila. At the end of the growing season, there were more than 75% and 35% cumulative disease incidences at Aralaganwila during 2012 *Yala* season and 2012/13 *Maha* season with some treatments. It hints that the sick plot is rich with fungal bulb rot pathogens. Orius dipped in 24hrs (T25) showed the significant highest DI of >75% in 2012 *Yala* season. In both seasons, current recommendation bulbs dipped in Homai for 30 min (T16) and Captan for 1hr (T2) gave the similar lower DI values. The T2 had maintained the lowest DI value throughout the season. Results of the experiment repeated in 2012/13 *Maha* season also confirmed the results obtained in 2012 *Yala*. Results of field trials conducted during 2012 *Yala* and 2012/13 *Maha* seasons have confirmed that Fluazinam 500 g/l SC (Tizca) and Tebuconazole 250 ml/l (Orius) did not show any effective control on tested fungi.

Both treatments of bulbs dipped for 1 hour in Captan 50% WP at the rate of 10 g/10l and Homai (Thiophanate methyl 50% + Thiram 30% WP), 18g/10l in 30 minutes application had shown as the best treatment among the tested treatments for cluster onion in DL_{2b} agro ecological zone for fungal bulb rot management in field conditions. *In - vitro* testing also confirmed that the Captan 50% WP and Homai at the same rate are the better fungicides to control *Fusarium* spp and *Sclerotium rolfsii,* two main pathogenic fungi causing fungal bulb rot in cluster onion. Therefore, both Captan 50% WP at the rate of 10 g/10l and Homai (Thiophanate methyl 50% + Thiram 30% WP), 18 g/10l in 30

minutes can be recommended as effective fungicides to control fungal bulb rot in cluster onion.

REFERENCES

Coventry, E., Noble, R., Mead, A. and Whipps, J.M., 2005, Suppression of *Allium* white rot (*Sclerotium cepivorum*) in different soils using vegetable wastes. European Journal of Plant Pathology 111:101-112.

Diab, H., Hu, S. and Benson, D.M., 2003. Suppression of *Rhizoctonia solani* on impatiens by enhanced microbial activity in composted swine waste amended potting mixes. Phytopathology 93: 1115-1123.

Fernando, M.S.W., Silva De S.H.S.A., Ekanayake, K.E.M.N.K., Kanchana, S., Mahindapala, P. and Sudumanike, R.M.C., 2013. Effect of different cowdung levels on fungal bulb rot incidence of cluster onion raised by bulbs. Annals of the Sri Lanka Department of Agriculture 15: 183-194.

Pesticide Recommendations, 2015. Department of Agriculture. Peradeniya. Sri Lanka. 48.

Szczech, M.M., 1999. Suppressiveness of vermicompost against *Fusarium* wilts of tomato. Journal of Phytopathology 147:155-161.

Veeken, A.H.M., Block, W.J., Curci, F., Coenen, G.C.M., Temorshuizen, A.J. and Hamelers, H.V.M., 2005. Improving quality of composted biowaste to enhance disease suppressiveness of compost-amended, peat based potting mixes. Soil Biology and Biochemistry 37: 2131-2140.