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DETERMİNATİON OF CHEMİCAL FUNGİCİDE AGAİNST SOİL BORNE FUNGAL DİSEASES OF CAPERS (*Capparis ovata* DESF. VAR. HERBACEA) DURİNG EARLY STAGES

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Capparis ovata Desf. var. Herbacea seeds have very low germination percentage (5-10%) due to high dormancy. The seedlings have low survival rate due to number of fungal diseases, which infest them during early stages of development in the fields. Subsequently, the germinating seedlings began to dry and die, which make it very difficult to develop caper gardens. To control this problem effectively, 4 fungicides namely Fosetyl-Al, Hymexzazol, metalaxy + Mancozeb, Propamocarb were tested. Each fungicide was sprayed at three different times, at intervals of 3 days. The results showed that the fungicide Fosetyl-Al powder was the most effective to control seedling loss due to fungal diseases when sprayed after three days of culture.

Keywords: *Capparis* spp., soil borne diseases, chemical control, fungicides

INTRODUCTION

Capparis ovata Desf. var. Herbacea bush, is a medicinal perennial winter-deciduous species that bears round fleshy leaves and large white to pinkish-white colored flowers that makes it important as an ornamental plant. *C. ovata* var. Herbacea plants are resistant to drought, with very deep roots and has deep spreading root system that can be used to control soil erosion (Soyler and Arslan,1999). The plant is best known for the edible bud and fruit (caper berry), which are usually used as pickle. Flower buds are rich in protein, and contain many medicinally important antioxidants and alkaloids. Caper buds, flowers, fruit, leaves and stem bark are used in number of ways to treat many disorders since ancient times as *Capparis ovata* var. Herbacea is very important medicinally.

Certain species and varieties of capers are found in the Mediterranean basin, of which *C spinosa* L., *Cappris Ovata* Desf., *C. leucophylla* D.C., *C. Mucronifolia* Boiss., *C. Cartillaginea* Decne. and *C. decidua* (Fors) Edgew are more important (Zohary, 1960). There are two species of caper found in Turkey namely *C. spinosa* L. and *C. Ovata* Desf with three sub-species each (Davis, 1965). The plants of *C. spinosa* are distributed in coastal areas (Adana, Antalya, Balıkesir, İstanbul, Artvin, Çanakkale, Denizli), Central Anatolia Muğla, Ankara, Tokat,) and Southeast Anatolia (Diyarbakır, Hakkari , Mardin, Şanlıurfa) of Turkey; whereas *C. ovata* species are widely distributed in the Central Anatolia and the Mediterranean regions.

Owing to biotic and abiotic stresses, the plant yield drop very low. Among the biotic factors, diseases are serious threat to *Capparis ovata* Desf. var. Herbacea production throughout the world. Number of *Capparis* diseases are caused by fungi, beside the diseases caused by bacteria, viruses, nematodes and plant parasites. Fungal diseases like *Albugo capparidis* DeBarry, *Leveillula taurica* (Lev) G. and *Sclerotium rolfsii* SaccA rnaud in *Capparis spinosa* (Tomassoli *et al*., 2006), *Albugo capparidis*, *Aschochyta capparidis* (Cast.) Sacc., *Botrytis* sp. *Camarosporium suseganense* Sacc.et Speg., *Cercospora capparidis* Sacc., *Cloeo sporiumhians* PecketSacc., *Hendersonia rupestris* Sacc.et Speg., *Leptosphaeria capparidis* Pass., *Phoma capparidina* Pass., *Phoma capparidis* Pass., *Phyllosticta capparidis* Sacc.et Speg. and *Septoria capparidis* affects *Capparis* in number of ways including drying of plants and seedlings death; which limit its production and cultivation. Once the seedlings are infested with fungal diseases, it is impossible to control them and whole nursery dies with in few days.

There is no study relating to fungal diseases that affects growing of these plants during early stages of development. The objective of the study was to find an appropriate fungicide among Fosetyl-Al WP, Hymexazol 30 L SC, Metalaxyl+mancozeb WP and Propamocarb EC, to determine its effective dose and appropriate time of application, helping seedlings establishment and prevent their early death under field conditions.

MATERIALS AND METHODS

Material of the study was consisted of *C. ovata* var. Herbacea seeds, stainer buckets, 4 fungicdes Fosetyl-Al WP, Hymexazol 30 L SC, Metalaxyl+mancozeb WP and Propamocarb EC (Table 1) and naturally fungus infested fields with *Albugo capparidis* DeBarry, *Leveillula taurica* (Lev) G. and *Sclerotium rolfsii* SaccA rnaud in *Capparis spinosa* (Tomassoli *et al*., 2006). *Albugo capparidis* and *Aschochyta capparidis* (Cast.) Sacc. were used as control. The fungi were isolated and confirmed at Adana Plant Protection Research Institute, Adana, Turkey. The doses of fungicides were selected after considering their effective doses against different plants. The experiment was conducted using randomized block design with 4 replications each in 4 plots of 1 m length. Two hundred seeds were germinated by the giving GA_3 treatment and pretreated with cold to break seed dormancy (Soyler and Khawar, 2006). Every row contained 20 seeds placed at a distance of 20 cm (50 x 4 = 200 seeds).

Two hundred seeds each of *C. Ovata* var. Herbacea were treated with GA_3 and pre treated with cold to break seed dormancy and germinate the seeds (Soyler and Khawar, 2006). The experiments were conducted during 2008 and 2009 at Kirikhan district of Hatay province in Turkey. Each plot was treated with fungicides manually using 1 litre bucket fitted with filter sprayers. The control plots were treated with equivalent quantity of water. Sprays were repeated after 3 days. The seeds in each plot were watered every day. During first year, the first plots were sprayed with fungicides soon after sowing the seeds on 29.05.2008. The second plots were sprayed after 3 days on 1.06.2008 and third plots were sprayed after 6 days on 04.06.2008. During 2nd year the first plots were sprayed soon after sowing the seeds on 27.05.2009. The second plots were sprayed after 3 days on 30.05.2009 and the third plots were sprayed after 6 days on 02.06.2009. The assessments of the effectiveness of fungicides was made by analyzing the number of growing plants showing symptoms of soil borne diseases to spray after 15 days of spraying of fungicides during both years.

RESULTS

As shown in Table 2, the number of days to treat soil with fungicides after seed sowing significantly ($p<0.01$) affected the germination of plants when spray was done soon after sowing, three days after sowing or six days after sowing during both years. Germination of seeds ranged 8.75 to 19.50%. Germination of seeds reduced significantly ($p<0.01$) when spray was done soon after sowing, three days after sowing or six days after sowing compared to control control seeds sown in infested fields (Table 2). It was noted that Fosetyl-Al powder was highly effective when sprayed after 3 days and showed sharp increase in survival, when compared to sprays done soon after sowing or six days after sowing. Hymexazol treated plants showed least survival, when sprayed soon after sowing. They showed maximum survival, when sprayed after three days. Although spray with Metalaxyl+Mancozeb-powder showed variable survival of plants after three sprays in numerical sense; it had similar effect on survival of plants statistically. Similarly Propamocarp showed an increase in survival of plants when sprayed soon after sowing and after six days. In general terms, Fosetyl-Al powder was the most effective when sprayed, soon after sowing and after three days with survival of 16.44% and 19.50% seedlings, respectively. The results showed that Propamocarp application was most effective, when it was sprayed aftersix days with germination of

Table 1. Doses and formulations of fungicides used in the experiment

Fungicides	Formulations	Dose per 100 litre water
Fosetyl-Al	WP	200 g
Hymexazol 30 L	SC	300 ml
Metalaxyl+mancozeb	WP	250 g
Propamocarb	EC	60 ml

Table 2 . Effects of different funcicides against soil borne diseases in Kirikhan district (Hatay) during 2008

Treatments	Germination percentage of seeds (%)		
	Spray soon after sowing the seeds	Spray after three days	Spray after six days
Control	9.52 b	9.52 b	9.52 b
Aliet (Fosetyl-Al powder)	16.44 a	19.50 a	10.06 bc
Tachigeren (Hymexazol)	10.63 b	15.50 ab	12.81 ab
Previcur(Metalaxyl+Mancozeb powder)	10.88 b	12.56 bc	13.06 ab
Riodenet (Propamocarp)	8.75 b	11.94 bc	16.81 a

Mean values with in a single row followed by different letters are significantly different using Duncans test at p<0.01 level of significance.

Table 3. Effects of different funcicides against soil borne diseases in Kirikhan district (Hatay) during 2009

Treatments	Germination percentage of seeds (%)		
	Spray soon after sowing the seeds	Spray after three days	Spray after six days
Control	6.69*bc	6.69*c	6.69bc*
Aliet (Fosetyl-Al powder)	17.23 a	20.01 a	15.99 ab
Tachigeren (Hymexazol)	10.62 b	15.50 ab	10.06 bc
Previcur(Metalaxyl+Mancozeb powder)	10.88 b	12.56 bc	12.81 ab
Riodenet (Propamocarp)	8.75 b	11.94 bc	13.06 ab

Mean values with in a single row followed by different letters are significantly different using Duncans test at p<0.01 level of significance

16.81%. As shown in Table 3, different fungicides significantly (p<0.01) affected the number of plants, when sprayed soon after sowing, after three and six days of culture. Germination of seeds varied between 8.75 to 20.01% (Table 3, p<0.01). Germination of 6.69% seeds was obtained under control conditions on seeds sown in infested fields. It could be noted that Fosetyl-Al powder was highly effective when sprayed after three days and showed sharp decrease in germination when sprayed soon after sowing or after six days. Hymexazol had insignificant effect on germination with least survival when sprayed soon after or after and six days. It had maximum survival when sprayed after 3 days. Metalaxyl+Mancozeb-powder showed variable survival of plants in three sprays numerically but had similar effect on germination of plants statistically. Propamocarp showed sharp increase in germination of plants, when sprayed after 6 days. In general terms, Fosetyl-Al powder was most effective when sprayed after 3 days with germination of 20.01%.

DISCUSSION

Fungi are the causal agents of numerous fungal plant diseases, causing losses in agricultural production worldwide (Veloukas *et al*., 2007). If we consider the prevalence, ubiquitous nature and the ability of fungi to cause epidemics in relatively short period, there is need to evolve disease management strategies for secure agricultural production. Phytomycological diseases are most commonly controlled using various chemicals called fungicides. It is recommended that the fungicides should be applied before infection for proper control of the disease. The fungicides suppress, kill or destroy the fungus present in form of fungal spores, hyphae or other fungal structures. Sometimes, it is better if disease control measures are performed after the infection has occurred (Ivic, 2010). This is in line with the study, where maximum germination was obtained, when spray was done after 6 or 9 days of culture. Reduced germination was recorded when the spray was done soon after culture.

Systemic fungicides are absorbed by the plant and translocated in it over shorter or longer distance. In this way, phytotoxins or fungicides come in active contact with the pathogen and eliminate them. Movement and translocation of fungicides within the plant differs between various fungicide active compounds, and delineation between systemic and non-systemic fungicides is often not clear (Jacob and Neumann, 1987) as has been shown in this study. This shows that disease management in *C. ovata* could be easy from practical point of view to achieve a relatively efficient control after the infection has already occurred. If we compare the results of the study for two years, parallel results are very evident with significant differences among treatment means and control. It is clear that Previcur (propamocarb) and Ridonet (metalaxyl+mancozab) application was less effective to treat the diseases. However, Fosetyl-Al seemed most effective and easy in uptake, translocation and distribution in the plant and showed more harm to the pathogen development compared to other fungicides. It is concluded that this fungicides with curative and eradicative effects contributed to efficient and economical control of fungal diseases with significant advantages in *C. ovata* var. Herbacea protection compared to other fungicides. Similar results were recorded by McKenzie (1988), Afek and Menge (1990) and Canihos (2003) in number of other crops using these fungicides.

The study meets objectives of the research and successfully evaluated the effectiveness of 4 fungicides on eradication of *Albugo capparidis* DeBarry, *Leveillula taurica* (Lev) G. and *Sclerotium rolfsii* SaccA rnaud in *Capparis spinosa* (Tomassoli *et al*., 2006), *Albugo capparidis*, *Aschochyta capparidis* (Cast.) Sacc.sp. and other soil borne fungi by comparing it with untreated seeds (control). It is concluded that use of Fosetyl-Al can be effectively used to protect *C. ovata* var. Herbacea seedlings against number of unwanted soil borne fungi.

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