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MYCORRHIZAL ASSOCIATION IN SOME WEEDS OF *Curcuma longa* FIELDS OF DISTRICT KASUR, PAKISTAN

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ABSTRACT

Detailed study was completed in district Kasur for association of vesicular arbuscular mycorrhizal fungi (VAM) with weeds of Curcuma longa. For this purpose, 14 weed species including Sonchus aspera L., Chenopodium album L., Rumex dentatus L., Ageratum conyzoides L., Convolvulus arvensis L., Cynodon dactylon Pers., Oxalis corniculata L., Malva parviflora L., Malvastrum coromandelianum L., Trifolium resupinatum L., Euphorbia prostrata L., Anagallis arvensis, Phalaris minor Retz., and Cirsium arvensis L. belonging to eight angiospermic families were studied for arbuscular mycorrhizal association. The infection was maximum on S. aspera L. (81.2%), followed by C. dactylon (70.1%), O. corniculata (69.3%), M. Coromandelianum (68.2%), and P. minor (66.5%). However, Ageratum conyzoides L. (6.5%) and T. resupinatum (7.3%) were poorly colonized. Sonchus aspera L. and Ageratum conyzoides belonging to family Astereaceae showed variable sequence of colonization which meant that there is no association of the family in this characteristic but the association of these weeds is with Curcuma longa and other weeds of the fields.

Key words: AM fungi, *Curcuma longa*, Kasur, Pakistan, turmeric, weeds.

INTRODUCTION

Mycorrhizal fungi are widespread in agricultural systems and are especially relevant for organic agriculture because they can act as natural fertilizers and enhance plant yield. Mycorrhizal association with plants is a universal occurrence. *Arbuscular mycorrhizal* (AM) fungi form extensive hyphal networks in soil and provide plants with nutrients in return for assimilates (Smith and Read, 1997). Moreover, AM fungi can act as support system for seedling establishment, provide resistance against drought and some pathogens, and can enhance biological diversity in grassland (Van-der-Heijden *et al.,* 1998). Several studies have shown that AM fungi contribute up to 90% of plant Phosphorus demand (Jakobsen *et al.,* 1992; Van-der-Heijden *et al.,* 2006).

Various biological elements interact to sustain the species diversity and ecosystem functions (productivity, nutrient retention,

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nutrient cycling). One of the biotic factors potentially important in building up ecosystem functions and enhancing plant diversity is mycorrhizal associations (Janos, 1980; Van-der-Heijden *et al.,* 1998; Klironomos *et al*., 2000).

Mycorrhizal infection is an important factor to determine the weeds associated with various crop fields. Arbuscular mycorrhizas improve the growth and nutrient uptake of plants and are formed in more than 80% of all the land plants. District Kasur, Punjab, Pakistan shares more than 80% of *Trurmeric* production to the country. Here, the purpose of study is to determine the AM infection in weeds of *Curcuma longa* fields in District Kasur, Pakistan.

MATERIALS AND METHODS

Fourteen weed species with their root systems were collected from at least three individuals of each species, cleared and stained according to Phillips and Hayman (1970), modified by Koske and Gemma (1989). The roots were examined @100X (oil emersion) for mycorrhizal colonization using a modified version of the magnified intersection method (McGonigle *et al*., 1990). The arbuscular, vesicular and hyphal colonization were calculated by dividing the count for vesicle, arbuscle and hyphae categories respectively by the total number of intersections examined. The total root colonized by mycorrhizal fungi was quantified as the proportion of non-negative intersections. Counts were expressed as percentages.

RESULTS AND DISCUSSION

Mycorrhizal colonization by arbuscular mycorrhizal fungi was studied in the roots of fourteen weed species *Sonchus aspera L., Chenopodium album L., Rumex dentatus L., Ageratum conyzoides L., Convolvulus arvensis L., Cynodon dactylon Pers., Oxalis corniculata L., Malva parviflora L., Malvastrum coromandelianum L., Trifolium resupinatum L., Euphorbia prostrata L., Phalaris minor Retz., Cirsium arvense L.* belonging to eight angiospermic families viz; *Asteraceae, Chenopodiaceae, Polygonaceae, Convolvulaceae, Poaceae, Malvaceae, Euphorbiaceae* and *Primulaceae*.

The AM infection was recorded in all of the tested weed roots. Weeds are generally mycorrhizal and some of them possibly play a positive role in agricultural system maintaining the mycorrhizal symbiosis which varies from species to species of even the same family. Arbuscular mycorrhizal association has been reported to occur in about 80% of terrestrial plants including trees, herbs, shrubs, forbs and grasses (Gregory, 2006). A very high percentage of AM infection was found in *Sonchus aspera* (81.2%) and *Ageratum conyzoides*

showed the minimum infection (6.5%) *belonging* to family *Asteraceae* (Fig. 1, A & D).

Arbuscular Mycorrhizal fungi occur over a wide range of agro-climatic conditions and geographically ubiquitous. They form symbiotic relationships with roots about 90% land plant in natural and agricultural ecosystems (Brundrett, 2002). AM association has been observed in 200 families of plants representing 100 genera and about 300,000 plants species (Bagyaraj, 1991). It is normal for the roots of plants to be mycorrhizal as it is for the leaves to photosysthesis (Mosse, 1986). AM colonization ranging from 21-70% was found in *Convolvulus arvensis, Anagallis arvensis, Malva parviflora, Malvastrum coromandelianum, Chenopodium album, Euphorbia prostrata, Rumex dentatus, Phalaris minor, Oxalis corniculata, Cynodon dactylon belonging to families Convolvulaceae, Primulaceae, Poaceae, Malvaceae, Chenopodiaceae, Euphorbiaceae* and *Polygonaceae*.

Arbuscular mycorrhizal fungi (AMF) are important soil micro-organisms (Liu and Lianfeng, 2008) that play a key role in facilitating nutrients uptake by crops in a variety of agro-ecosystems particularly in low input farming system and in re-vegetation and rhicomerediation processes (Barea and Jeffries, 1995; Jansa *et al.,* 2008). A very low percentage of AM infection was found in *Ageratum conyzoides* (06.5), *Trifolium resupinatum* (7.3) and *Cirsium arvence* (9.4) from *Asteraceae, Chenopodiaceae and Asteraceae,* respectively. Different rates of colonization in members of the same family result that there is no association of family characteristics AM infection but the association of these weeds is with *Curcuma longa* and other weeds of the fields.

Table-1. The percentage of VAM infection on weeds of *Turmeric* fields Kasur Pakistan.

Weeds	Families	% of AM Infection
Sonchus aspera	*Asteraceae*	81.2[x]
Chenopodium album	*Chenopodiaceae*	32.6
Rumex dentatus	*Polygonaceae*	44.8
Ageratum conyzoides	*Asteraceae*	06.5
Convolvulus arvensis	*Convolvulaceae*	21.3
Cynodon dactylon	*Poaceae*	70.1
Oxalis corniculata	*Poaceae*	69.3
Malva parviflora	*Malvaceae*	29.7
Malvestrum cromandlianum	*Malvaceae*	68.2
Euphorbia prostarta	*Euphorbiaceae*	42.9
Anagalous arvensis	*Primulaceae*	28.6
Trifolium resupinatum	*Chenopodiaceae*	7.3
Phalaris minor	*Poaceae*	66.5
Circum arvences	*Asteraceae*	9.4

[x] % of VAM infection = (Length of infected roots/ Length of roots observed)×100

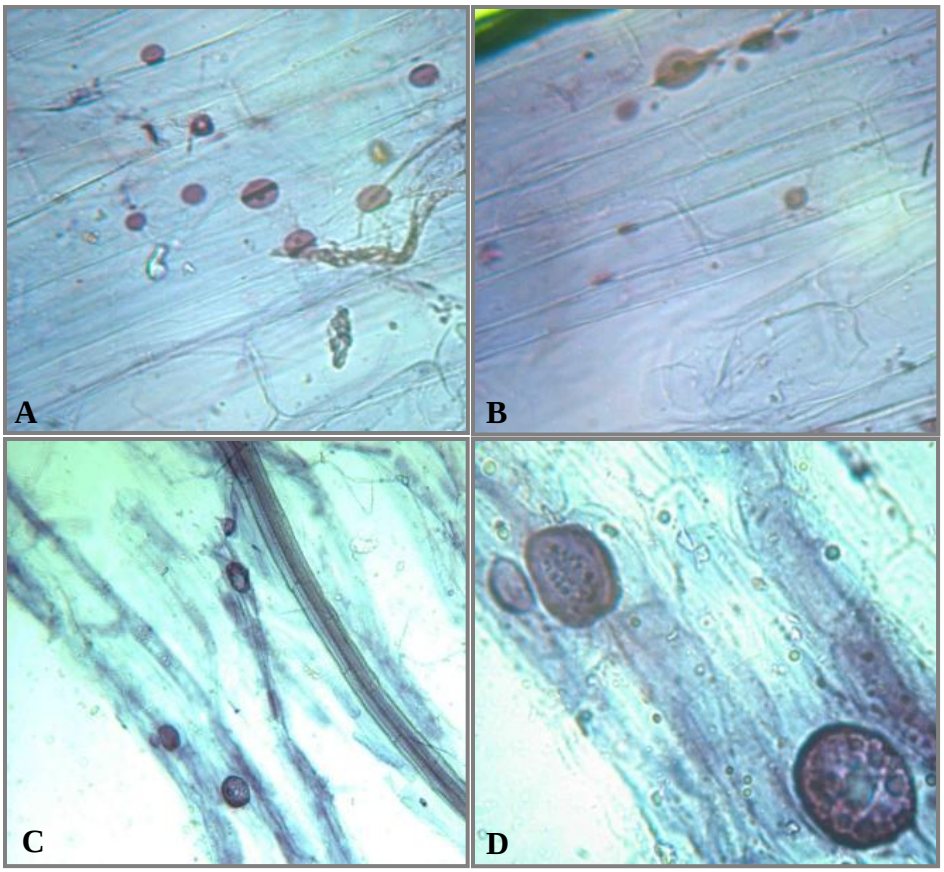

Figure 1. VAM infection of (A) *Sonchus aspera* (B) *Cynodon dactylon* (C) *Anagalous arvensis* (D) *Ageratum conyzoides.*

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