SCREENING OF SUNFLOWER (*HELIANTHUS ANNUUS* L.) VARIETIES AGAINST CHARCOAL ROT FUNGUS, *MACROPHOMINA PHASEOLINA* (TASSI) GOID.

MUHAMMAD ANIS, M. JAVED ZAKI AND SHAHNAZ DAWAR

Department of Botany, University of Karachi, Karachi-75270, Pakistan

Abstract

Sunflower (*Helianthus annuus* L.) varieties like Aussie gold-04, Aussie gold-62, Hysun-33, Hysun-39, NK Armoni and S-278 were screened against *Macrophomina phaseolina* (Tassi) Goid. Seeds of each variety were separately sown in 8 cm diam., plastic pots containing 300 g soil/ pot. There were two sets of pots i.e., i) autoclaved soil (sterilized soil), ii) soil naturally infested with sclerotia of *M. phaseolina (*non-sterilized). All six varieties showed significantly improved plant growth and vigour in non inoculated autoclaved soil whereas all varieties showed incidence of root rot by *M. phaseolina* in naturally infested soil. Hysun-39 showed significantly low incidence of *M. phaseolina* (13%) followed by Hysun-39 (27%). Hysun-33 also showed greater plant length followed by Aussie gold 62 in non-sterilized soil.

Introduction

Macrophomina phaseolina (Tassi) Goid is a soil-borne fungal pathogen belongs to deutromycetes, distributed world wide on crop and non crop plant species (Su *et al.*, 2001). This fungal pathogen causes seedling blight, stem rot and pod rot and has more than 500 plant species as a host range whereas more than 67 host species of this pathogen have been reported from Pakistan (Sinclair, 1982; Mirza and Qureshi, 1982; Shehzad *et al.*, 1988). No chemical control currently exists for charcoal rot, and resistance has been hard to identify. Due to soil- borne nature of the pathogen, control strategies other than host resistance are not much effective and economical. Varietal screening against this disease in sunflower (Mirza *et al*., 1982; Hafeez & Ahmad, 2001), in urd bean (Iqbal *et al.* 2003) and sesame (Mirza *et al*., 1986) in Pakistan has been reported.

In Pakistan total area under sunflower crop is about 113998 hectares with the total production 149502 tonnes (Anonymous, 2000). So the average yield is about 1311.44 kg/ha which is much lower than the yield potential of 2890 kg/hectare of existing sunflower cultivars in Pakistan (Mirza and Beg, 1982). Sunflower production in Pakistan is also very low as compared to other countries of the world, such as France 2600, China 1709, USA 1479 and Turkey 1406 kg/ha (Anonymous, 1997). Host plant resistance-based management of Macrophomina is a potential option for resource-poor farmers. However, in cowpea, only minor sources of resistance have been reported among a few genotypes evaluated in India and Senegal (Singh and Lodha, 1986; Gaikwad and Sokhi, 1987).

The purpose of this study was to evaluate the varietal screening of sunflower against *M. phaseolina* infection.

Materials and Methods

Collection of sunflower varieties: Six varieties of sunflower viz., Aussie gold 04, Aussie gold 62, Hysun 33, Hysun 39, NK-Armoni and S-278 were collected from Federal Seed Certification Department, Malir Cantt., Karachi.

Soil properties: Soil was collected from experimental plots of Department of Botany, University of Karachi. The soil having natural infestation of 3-5 sclerotia/ g soil (Sheikh and Ghaffar, 1975) and for control soil was sterilized at 121 ˚C. The pH of soil is 8.2, moisture holding capacity of 24.04 % (Keen and Raczkowski, 1922), total nitrogen 1.5 % (Mackenzie and Wallace, 1954) and total organic matter 23 %.

Green-house Experiment*:* Sunflower seeds (*Helianthus annuus* L.) varieties like Aussie gold 04, Aussie gold 62, Hysun 33, Hysun 39, NK-Armoni and S-278 were surface sterilized using 1 % $Ca(OCl)_2$ for three mints., rinsed thoroughly in running tap water and dried aseptically. Five seeds of different varieties of sunflower were sown separately in each pot and there were three replicates of each treatment. Pots were kept in a randomized fashion at 50% MWHC in the screen house of Department of Botany, University of Karachi. After 30 days of seedling emergence, the plant growth parameters in terms of plant height, weight, vigour index were recorded. For the colonization %, five, one cm long root pieces after washing in running tap water were plated on potato dextrose agar (PDA) containing streptomycin (0.2 g/l) and penicillin (100,000 units/l).

Statistical Analysis: Data were analyzed and subjected to analysis of variance (ANOVA) according to Gomez and Gomez (1984). The follow up of ANOVA included least significant difference (LSD).

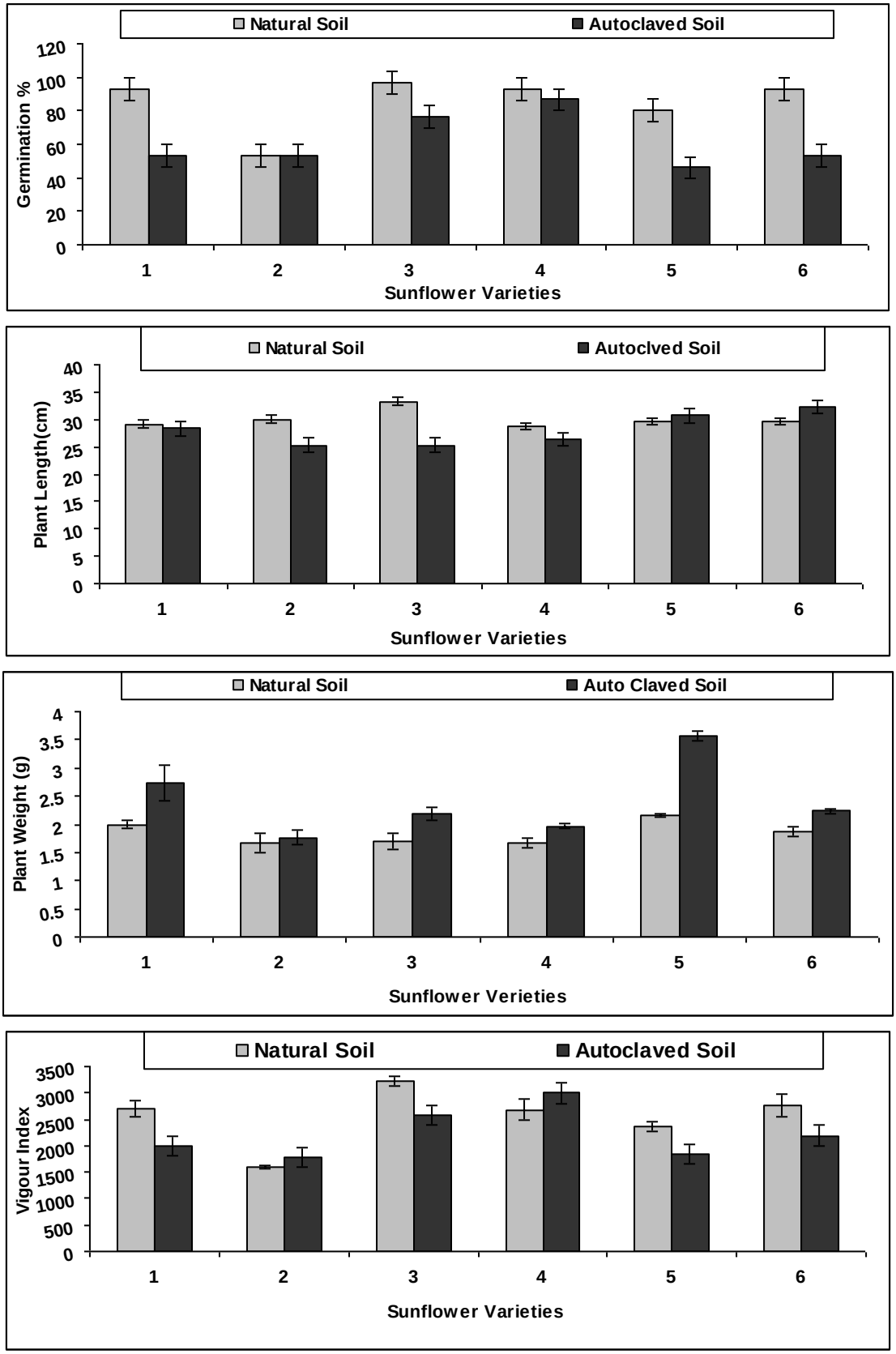

Fig.1. Growth of sunflower varieties in natural and autoclaved soil. Bar shows standard error (SE±). 1= Aussiegold 04, 2 = Aussiegold 62, 3 = Hysun 33, 4 = Hysun 39, 5 = NK -- Armoni, 6 = S -- 278.

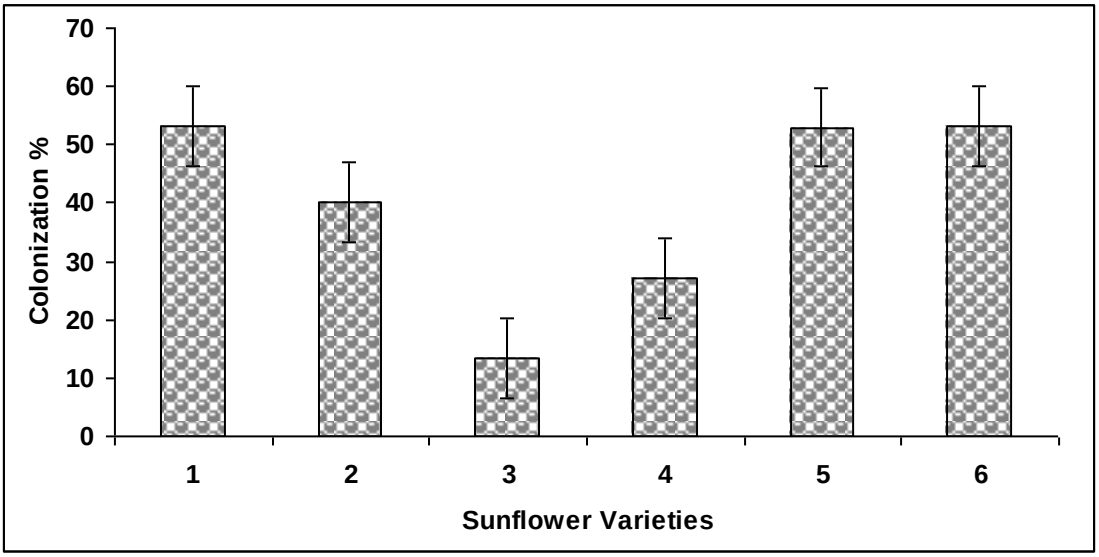

Fig.2. Screening of sunflower varieties against *M. phaseolina* in natural soil. Bar shows standard error (SE±). 1= Aussiegold 04, 2 = Aussiegold 62, 3 = Hysun 33, 4 = Hysun 39, 5 = NK -- Armoni, 6 = S -- 278.

Results and Discussion

Sunflower (*Helianthus annuus* L.) varieties like Aussie gold-04, Aussie gold-62, Hysun-33, Hysun-39, NK Armoni and S-278 were screened against *Macrophomina phaseolina* (Tassi) Goid. in autoclaved soil (control) and naturally infested soil. All six varieties showed significantly improved plant growth and vigour in autoclaved soil (control) as compared to naturally infested soil. In control soil maximum plant length was recorded in NK-Armoni followed by S-278. Similarly NK-Armoni showed greater plant weight followed by Aussiegold-04. Plant vigour index was greater in Hysun-39 followed by Hysun-33. All varieties showed incidence of root rot by *M. phaseolina* in naturally infested soil. Hysun-33 showed significant reduction in incidence of *M. phaseolina* (13%) followed by Hysun-39(27%) showed little resistance against *M. phaseolina.* Maximum root colonization was recorded in Aussie gold-04 followed by NK-Armoni and S-278 which are high susceptibility against *M. phaseolina* but no variety is found to be immune against *M. phaseolina*. Hysun-33 showed greater plant length followed by Aussie gold 62 in infested soil (Fig.1 and 2).

There are many researchers who worked on several varieties to observe their resistance level against charcoal rot disease. Khan and Shuaib (2007) reported that mungbean genotypes NCM 252-10 and 40536 were highly resistant against *M. phaseolina* infection. Hysun-33 was comparatively more resistant to *M. phaseolina* infection followed by Hysun-39. Similar results were obtained by Dawar and Ghaffar (1998). Rehman *et al.*, (2006) reported that Hysun-33 gave significant results in increasing plant length, height and considered to be more tolerant of root knot infestation. Dreshka *et al.* (1974) found only one moderately resistance genotype amongst 163 tested genotype of mungbean. In our study one variety is found moderately resistance amongst 6 tested varieties. Pectins of the plant cell wall polysaccharides provide defense against pathogenic infection (Vorwerk *et al.*, 2004).

Radha (1953) observed that French bean plant infected with *M. phaseolina* had 50 % less pectin compound to healthy one. Mihail and Taylar (1995) reported that isolates of *M. phaseolina* collected from member of the Poaceae were less virulent on sunflower than those collected from Asteraceae, Euphorbiaceae or Fabaceae. Mayek-Perez *et al.* (2001) distinguished 84 amplified fragment length polymorphism (AFLP) genotypes but only 43 pathotypes on the basis of their reaction to 12 different cultivars of common bean. It is suggested that the seeds of all sunflower genotypes should be screened for resistance against *M. phaseolina* infection.

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