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Effect of Fungicides in Limiting the Growth of Seed Borne Fungi of Soybean

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Abstract: Six most predominantly occurring fungi on seeds of soybean were grown on PDA medium amended with five systematic fungicides for evaluating its effect on growth. The growth of *Alternaria alternata*, *Cladosporium cladosporoides*, *Macrophomina phaseolina*, *Drechslera specifera*, *Fusarium oxysporum* and *Rhizoctonia solani* were significantly reduced on PDA medium amended with 0.1% of either Captan, Vitavax, Dithane M45, Thiram and Benomyl. Of the five fungicides, Benomyl was found to be the most effective.

Key words: Soybean, Seed-borne fungi, fungicides.

Introduction

Pakistan is deficient in edible oil. In order to meet up the shortage, palm oil is imported from Malaysia and soybean oil from USA & Argentina. Approximately US$ 1 billion is spent on the import of edible oil (Anonymous, 1999-2000) which is the second highest import bill after fossil fuel (petroleum). Because of the low yield of the traditional oil-seed plants (mustard, raya, rape seed etc) edible oil demand cannot be met. Attempt is therefore being made to cultivate non-traditional oil seed plants (sunflower and soybean) in Pakistan. The agro-climatic condition of Pakistan is not conducive in general for palm oil cultivation. Sunflower and soybean have been found to have the potentiality to raise the productivity of edible oil in Pakistan. Hence the cultivation of soybean and sunflower is receiving considerable importance. Of the various diseases, seed borne diseases often cause a heavy loss in germination of seeds and growth of crop plants. In Pakistan, soybean seeds suffer from seed borne diseases which reduce the percentage of seed germination and also cause many diseases on soybean plants (Ghafoor and Khan, 1976; Hussain ***et al.***, 1989; Shaukat ***et al.***, 1989) and is also reported to cause diseases from other soybean growing countries of the world (Bolkan ***et al.***, 1989; Sinclair, 1993; Lee, 1986; Sinclair, 1989; Singh, 1991; Zad, 1982). On account of the importance of soybean as a source of protein in diet and as oil for cooking food, the diseases of soybean have drawn attention for its control. A chemotherapeutic approach to eliminate and/or reduce seed borne fungi has been reported by many a researchers (Lee, 1986; Singh, 1992; Sinclair, 1993; Shah, ***et al.***, 1994; Gupta, ***et al.***, 1994). This research was carried out to find out the effect of some fungicides on seed borne fungi of soybean found in Sindh.

Materials and Methods

The effect of five systematic fungicides viz Captan, Thiram, Dithane M45, Vitavax and Benomyl on the growth of six seed borne fungi of soybean was evaluated.

For this, 1 ml of 0.1% of each of the five fungicides was separately added in 100 ml potato dextrose agar (PDA) medium cooled to 40°C. Ten ml of the medium was poured in 6 cm Petri plate. A series of 10 Petri plates with and another without the addition of 5 fungicides were prepared separately for each of the fungicides.

A 0.2 cm disc cut by means of cork borer from the growing margin of six fungal colonies viz. ***Alternaria alternata***, ***Cladosporium cladosporoides***, ***Fusarium oxysporum***, ***Drechslera specifera***, ***Macrophomina phaseolina*** and ***Rhizoctonia solani*** earlier isolated from soybean seeds by Nasir (in press) was determined by the method of Allam ***et al.*** (1969). The data on the growth of the six seed borne fungi amended with fungicides was subjected to analysis of variance (ANOVA) followed by the least significance difference (LSD) according to Gomez and Gomez (1987).

Results and Discussions

The data on the growth rate of seed borne fungi of soybean on potato dextrose agar (PDA) with and without amendment of fungicides is presented in Table I . Amendment with any of the five fungicides in the growth medium (PDA) limited the growth of the six seed borne fungi as compared to the growth without amendment. Sinclair (1989) studied the effect of thermotherapy on the growth of seed borne fungi of soybean by immersing infected seeds of soybean in heated vegetable oil of palm, sunflower and soybean for a while as a means for eliminating and/or reducing seed borne fungi of soybean but it was not found effective and workable. Sinclair (1993) thereafter recommended management practices and biological control agents for eliminating/reducing seed borne fungi of soybean. The guidelines on disease management of soybean point to the use of pesticides in integrated pest management (Sinclair ***et al.***, 1997).

Following the widespread use of pesticides for the control of soybean seed borne diseases (Allam and Sinclair, 1969; Sunderesh and Hiranath, 1982; Shah ***et al.***, 1992; Horn ***et al.***, 1975; Gupta ***et al.***, 1993; Sinclair, 1997), it was considered worthwhile to use systematic fungicide viz. Captan, Thiram, Dithane M45, Vitavax and Benomyl as seed dressing fungicides. The most predominantly occurring seed borne fungi of soybean isolated by Nasir (in press) from agro-climatic conditions of Sindh and also reported from Pakistan earlier (Ghafoor and Khan, 1976; Shaukat ***et al.***, 1989; Hussain ***et al.***, 1989) have been found to be ***Alternaria alternata***, ***Cladosporium cladosporoides***, ***Fusarium oxysporum***, ***Macrophomina phaseolina***, ***Drechslera-specifera*** and ***Rhizoctonia solani***. The growth rate of 6 fungi evaluated on PDA medium amended with fungicides showed significant reduction ($P < 0.05$) in growth and of the 5 fungicides, Benomyl showed least growth.

Kunwar ***et al.*** (1986) studied the histopathology of dark brown and shrunken seeds of soybean and found it to be infected with ***Alternaria alternata***. This fungus has been widely

Table 1: Effect of 5 fungicides on the average daily growth rate (mm) of 6 species of seed borne fungi of soyabean var. William 82 on PDA medium at 25°C

	With Fungicide					
Name of Fungi	Captan	DithaneM45	Thiram	Vitavax	Benomyl	Without Fungicide
Altemaria alternata	8.3	9.2	9.1	9.2	6.5	17.1
Cladosporium cladosporoides	10	9.7	8.3	7.6	7	16.8
Fusarium oxysporum	7.9	7.8	8.2	8.7	5.6	15.9
Macrophomina phaseolina	8.5	9	8.8	7.9	6.9	13.8
Drecheslera specifera	9.6	8.8	8.9	8.5	7.2	14.8
Rhizoctonia solani	10.2	9.2	9.5	8.9	7.3	16.7
Fungi LSD=0.84	Fungicide LSD =0.75					

reported as seed borne fungi of soybean and was encountered by us most frequently. Jordan ***et al.*** (1992) found environmental conditions on the incidence of seed borne fungi of soybean in Illinois as over-riding in pre-disposition of seeds to fungal infection regardless of soil types. The weather condition in the province of Sindh constituting southern Pakistan where this research was carried out does not differ much and the soil is largely made up of sandy loam. No remarkable difference in the occurrence of seed borne fungi was noticeable in isolations from soybean seed samples randomly collected from the districts of Karachi and Hyderabad situated in the province of Sindh.

In North Frontier Province (NFP), situated in North West Pakistan, the effect of seven different seed dressing fungicides on the germination and yield of soybean was investigated by Shah ***et al.*** (1992) which included the fungicides used by us. They noted increase in germination of soybean seeds to 78.5% as compared to with 48.8% in untreated seeds. The yield of soybean was reported to increase by the treatment of seeds with fungicides (Jauhri and Agarwal, 1984; Storold and Evans, 1981; Gupta ***et al.***, 1993). Horn ***et al.*** (1975) attributed the increase in seed weight rather in number of seeds in benomyl treated soybean. Of the five fungicides, Benomyl comparatively showed least growth and was found to be significantly different from others on the basis of the result Benomyl can be recommended to be used as seed dressing fungicide for the control of seed borne disease of soybean in Sindh in preference to other fungicides.

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