

CHEMICAL CONTROL OF SEED-BORNE FUNGAL PATHOGENS OF SUNFLOWER

Rauf Bhutta, A^{1*}, Rahber Bhatti, M.M.², Iftikhar Ahmad³
and Ishrat Sultana⁴

¹Federal Seed Certification and Registration Department, Mauve Area, G-9/4, Islamabad, Pakistan

²Department of Plant Pathology, Sindh Agricultural University, Tandojam, Pakistan

³National Agricultural Research Centre, PARC, Islamabad, Pakistan

⁴Pakistan Central Cotton Committee, Karachi, Pakistan

Received: August 14, 2000

Accepted: October 15, 2001

SUMMARY

Five fungicides, namely Tecto, Benlate, Bayton, Topsin and Derosal, were evaluated for their effect on seed germination and control of major seed-borne pathogens of sunflower. Two sunflower cultivars, HO-1 and NK-212, naturally infected with important seed-borne fungi were treated with these fungicides at 1.5, 2.0, 2.5, 3.0 g/kg. All the fungicides under study controlled the seed-borne fungi and increased the germination of sunflower seed to various levels. Tecto and Benlate in both cultivars gave better performance in reducing the fungal population and increasing seed germination. Topsin and Derosal also reduced the fungal population at higher dosage but there was no considerable improvement in germination. The use of fungicides at 2.5 g/kg provided almost complete elimination of fungi and 8-10 percent increase in seed germination as compared to the use of fungicides at 2 g/kg.

Key words: sunflower, fungicides, germination, fungal population

INTRODUCTION

Sunflower (*Helianthus annuus* L.) is the second important non-conventional source of vegetable oil seed in the world after soybean (Sackston, 1981). In Pakistan, sunflower was introduced as an oilseed crop in early 1960's and efforts are under way since 1980 to increase both its area and yield and thus to bridge the edible oil gap in the country (Beg, 1980). Although the national average yield has increased from 750 to 1500 kg per ha but it is still quite low compared with other sunflower growing countries of the world (Anonymous, 1994). Low yield can be contributed to several constraints including damage caused by parrots at maturity,

* Corresponding author

lack of organization for hybrid seed production, lack of suitable sunflower threshers and a number of parasitic and non-parasitic diseases (Muhammad and Khan, 1981). So far more than a dozen diseases have been recorded (Ahmad, 1981; Maširević *et al.*, 1987; Mirza and Beg, 1983; Ahmad *et al.*, 1992). Various types of leaf spots and rots are reported to be the main pathological field problems (Bhutta *et al.*, 1993). Most of the disease-causing microorganisms in sunflower are reported to be seed-borne in nature (Richardson, 1990). It is reported that seed-borne fungi caused 20-30 percent reduction in germination in sunflower (Jamaria *et al.*, 1975).

Some work has been done on the chemical control by Majid and Ilyas (1983) who found that in *in vitro* evaluation *Macrophomina phaseolina* mycelium was more sensitive to Tilt, Granosan, Benlate and Daconil and least sensitive to Sicarol. These fungicides have not been studied for treatment of sunflower seed for control of seed-borne diseases of sunflower in Pakistan. No adequate information is available on seed treatment except some work done by Jamaria *et al.* (1975) and Raut and Bhombe (1983). In the present study, five commercial seed dressing fungicides were used to treat sunflower seed to assess their effectiveness at different doses for the control of important seed-borne pathogens of sunflower.

MATERIALS AND METHODS

Five fungicides, namely Benlate, Tecto, Topsin, Bayton and Derosal, were used in this experiment. Two sunflower cultivars, NK-212 and HO-1, naturally infected with *Alternaria alternate*, *Drechslera tetramera*, *Emmericellopsis terricola*, *Fusarium solani*, *Macrophomina phaseolina* and *Phoma oleracea* were treated with each fungicide at 1.5, 2.0, 2.5 and 3.0 g/kg. Hundred seeds were tested in each set of four replicates, using standard agar plate method. Ten seeds were planted in each Petri dish. Incubation of seeds was carried out at 25°C for 7 days. Four hundred seeds were also planted on agar (PDA) without any treatment. Seeds were examined under stereoscopic microscope and fungi were identified based on their habitat characters on seed and colony characters on agar around the seeds (Barnett, 1960; Nelsen *et al.*, 1983). Results were expressed in percentages and analysed statistically. Separate set of experiment was carried out for each fungicide.

RESULTS AND DISCUSSION

All the fungicides controlled the seed-borne fungi and increased the germination of sunflower seed at various levels. Tecto, Benlate and Bayton considerably reduced the population of all the above fungi at lower dose of 1.5 g per kg and further minimized the population at higher dose 2.0, 2.5 and 3.0 g per kg (Figures 1, 2 and 3) but seed germination increased up to the dose 2.5 g/kg only. Topsin and Derosal also reduced the fungal population at the above mentioned higher dose but

there was no significant improvement in seed germination over control (Figures 4 and 5). No varietal difference was observed in this seed treatment study.

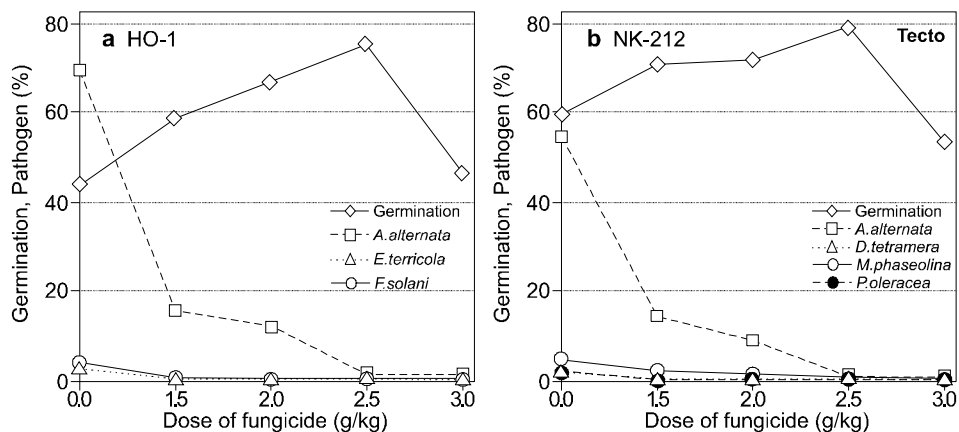


Figure 1: Effect of Tecto on seed borne fungal population and seed germination of sunflower

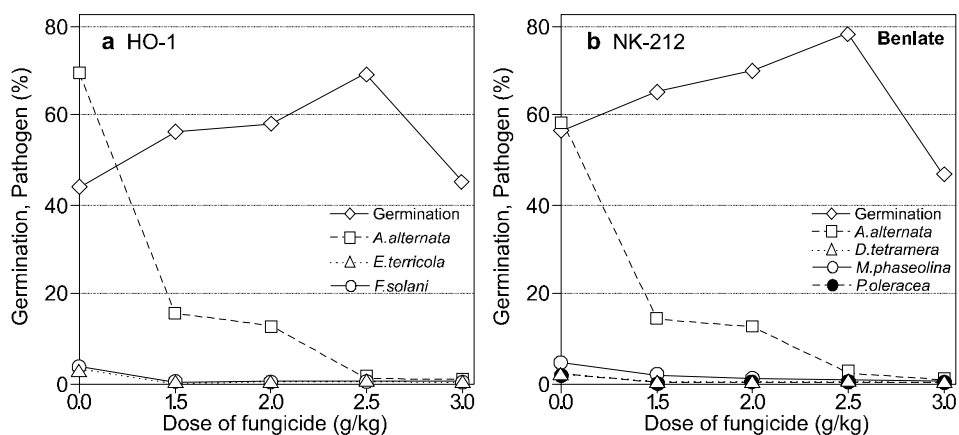


Figure 2: Effect of Benlate on seed borne fungal population and seed germination of sunflower

Tecto and Benlate showed better performance in reduction of fungal population and increase in germination than other seed-dressing fungicides under study. Similar effect of Benomyl was reported by Grewal and Singh (1965) and Majid and Ilyas (1983) on sunflower and some other crop seeds but no information is available on the effectiveness of different doses in these studies.

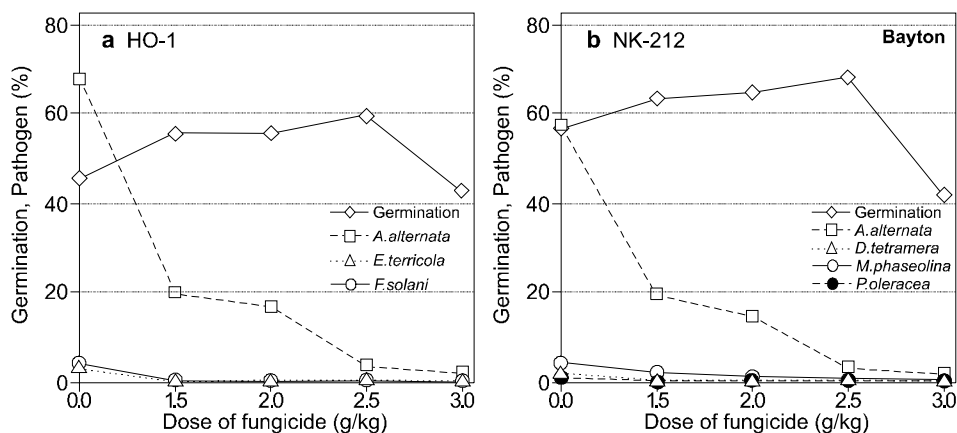


Figure 3: Effect of Bayton on seed borne fungal population and seed germination of sunflower

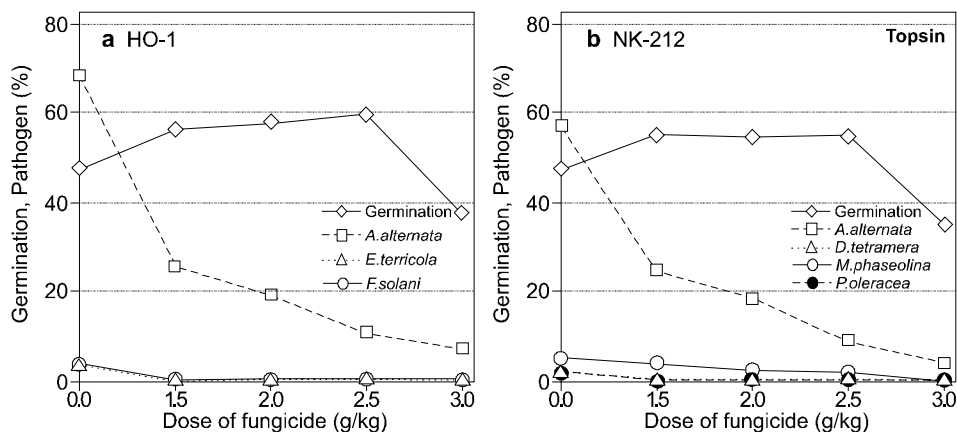


Figure 4: Effect of Topsin on seed borne fungal population and seed germination of sunflower

The difference in reduction of fungal population among these fungicides may be due to the difference in rate of fungicide absorption into seed and translocation into the growing seedlings (Vir, 1983). Benlate and Tecto have greater translocation rate than the other chemicals used in this study (Erwin, 1973). These fungicides minimized the fungal growth at higher dose than the recommended dose (2.0 g/kg). It would therefore appear that the fungicide Tecto and Benlate can be used at the dose of 2.5 g/kg to ensure maximum elimination of sunflower pathogens *i.e.*, *A. alternata*, *D. tetramera*, *F. terricola*, *F. solani*, *M. phaseolina* and *P. oleracea*.

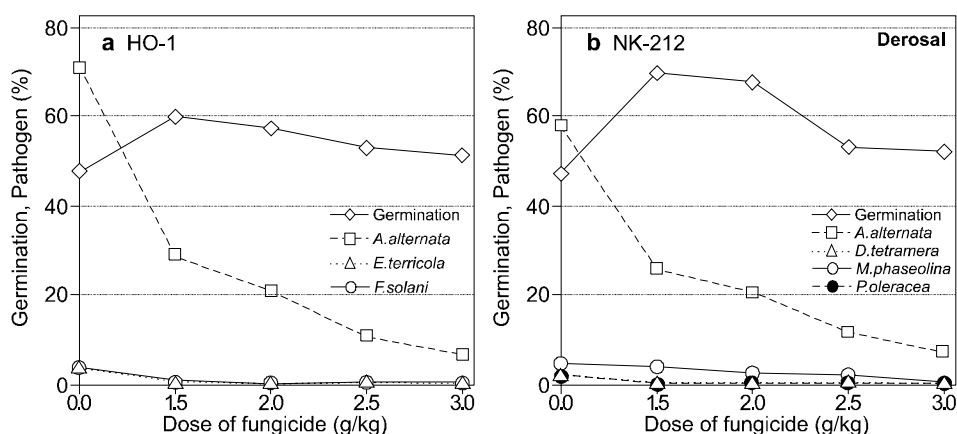


Figure 5: Effect of Derosal on seed borne fungal population and seed germination of sunflower

REFERENCES

- Ahmad, I., 1988. Occurrence of sunflower rots in Pakistan. PARC, Cargill Joint International Conference on Sunflower Diseases. May 27, 1998, Lahore.
- Ahmad, I., Iftikhar, S. and Bhutta, A.R., 1992. Seed-borne microorganisms in Pakistan. Checklist, 1991, PARC, Islamabad, pp. 32.
- Anonymous, 1994. FAO Production Year Book. Rome, Vol. 48, pp. 111.
- Beg, A., 1993. Exploring production potential in oilseed crop. Progressive Farming, 3(6): 14-19.
- Bhutta, A.R., Rahber-Bhatti, M.H., Solangi, G.R., Ahmad, I., Rehman, M.H., 1993. Sunflower production and pathological problems in Pakistan. Science Technology and Development, 2(2): 51-55.
- Barnett, H.L., 1960. Illustrated Genera of Imperfect Fungi. 2nd ed., Burgess Pub. Co. Minn., pp. 225.
- Erwin, D.C., 1973. Systemic fungicide, disease control, translocation and mode of action. Ann. Rev. Phytopathol., 2: 389-422.
- Frewal, J.S. and Singh, R.P., 1965. Chemical treatment of seed and nursery bed to control damping off of Cabbage. Indian Phytopath., 18: 225-228.
- Jamaria, S.L., Sharma, K.P. and Gupta, R.B.L., 1975. Fungi intercepted from sunflower seeds and their control. Indian Journal of Plant Pathology, 5: 212-213.
- Majid, A. and Ilyas, M.B., 1983. Chemotherapeutic control of root an stem rot of sunflower. J. Agric. Res., 21(4): 155-162.
- Maširević, S., Rana, M.A., Mirza, M.S. and Khan, M.A., 1987. Report on the sunflower crop in Pakistan. Spring, 1987, Oilseed Programme, NARC, Islamabad.
- Mirza, M.S. and Beg, A., 1983. Diseases of sunflower in Pakistan. FAO Bull. Helia, 6: 55-56.
- Muhammad, A. and Khan, A.N., 1981. Perspective of edible oil research and production in Pakistan. PARC, Islamabad, pp. 9.
- Nelsen, P.E., Toussoun, T.A. and Marasas, W.F.O., 1983. *Fusarium* species. An illustrated manual of identification. The State Univ. Press, pp. 203.
- Raut, J.G., and Bhmob, B.B., 1983. Efficiency of some fungicides and hot water in the control of seed-borne infection of *Macrophomina phaseolina* in sunflower. Indian Phytopath., 36(2): 294-296.
- Neergaard, P., 1979. Seed Pathology. Vol. I, The Macmillan Press Ltd., London, pp. 839.
- Richardson, M.J., 1990. An annotated list of seed-borne diseases. Publ. by ISTA, Switzerland.

- Sackston, W.E., 1981. The sunflower crop and diseases, progress, problems and prospects. *Plant Diseases*, 65(8): 643.
- Vir, D., 1983. Chemical seed treatment for controlling of seed-borne diseases in India. *Seed Sci. & Technol.*, 11: 935-948.

CONTROL QUÍMICO DE PATÓGENOS DE SEMILLAS EN GIRASOL

RESUMEN

Cinco fungicidas conocidos como Tecto, Benlate, Bayton, Topsin y Derosal, fueron evaluados por su efecto sobre la germinación y por el control de los principales patógenos en semillas de girasol. Dos cultivares del girasol, HO-1 y NK-212, infectados naturalmente con hongos en las semillas se trataron con estos fungicidas de 1.5, 2, 2.5, 3 g/kg. Todos los fungicidas bajo estudio controlaron los hongos en las semillas e incrementaron la germinación de las mismas en varios niveles. En ambos cultivares, Tecto y Benlate tuvieron mejor comportamiento reduciendo de población del hongo e incrementando la germinación de la semilla. Topsin y Derosal también redujeron la población de hongos a dosis más altas pero no hubo un mejoramiento considerable en la germinación. El uso de fungicidas 2.5 g/kg produjeron la casi completa eliminación de los hongos y el 8-10% de incremento en la germinación de la semilla comparados con el uso de fungicidas 2 g/kg.

MESURES DE DÉFENSE CONTRE LES CHAMPIGNONS PATHOGÈNES DU TOURNESOL TRANSMIS PAR LA SEMENCE

RÉSUMÉ

L'effet de cinq fongicides, le Tecto, le Benlate, le Bayton, le Topsin et le Derosal sur la germination de la semence et sur le contrôle des plus importants agents pathogènes du tournesol transmis par la semence a été évalué. Deux cultivars de tournesol, le HO-1 et le NK-212 infectés naturellement par des champignons transmis par la graine ont été traités avec ces fongicides à des doses de 1.5, 2.0, 2.5 et 3.0 g/kg. Tous les fongicides ont réussi à contrôler les champignons transmis par la graine et ont amélioré la germination de la graine de tournesol dans différentes mesures. Le Tecto et le Benlate se sont montrés les plus efficaces dans les deux cultivars pour ce qui concerne la diminution de la population des champignons et l'amélioration de la germination de la semence. Le Topsin et le Derosal ont eux aussi diminué la population des champignons mais ils n'ont pas eu un effet déterminant sur la germination. La dose de 2.5 g/kg a presque complètement éliminé les champignons et la germination a été améliorée de 8-10% par rapport à la germination obtenue avec la dose de 2 g/kg.