Effect of antibiotic and bio-fungicide for control of seed borne fungi of wheat

Abstract

The present study was effect of antibiotic and bio-fungicide for control of seed borne fungi of wheat during November to April, 2015-2016. In this study, applying different three treatments viz Control, Aureofungin with 100 ml water (Antibiotic), and Allium sativum leaf extract with cow urine (Bio-fungicide) for control of seed borne fungi of wheat respectively. In the pots, the result was obtained control 63.20 %, and disease incidence 23.30 % were recorded from Allium sativum leaf extract with cow urine (Bio-fungicide) in the T3 where as control 47.41% and disease incidence 33.33% were recorded from 4 gm. Aureofungin with 100 water (Antibiotic) in the T2. In the pots, the result was obtained control 68.75 %, and disease incidence 20 % were recorded from Allium sativum leaf extract with cow urine (Bio-fungicide) in the T3 where as control 52.09 % and disease incidence 30.66 % were recorded from 4 gm. Aureofungin with 100 ml water (Antibiotic) in the T2. Bio-fungicide was found superior in controlling of seed borne fungi of wheat compare than antibiotic. A bio-fungicide is composed of beneficial microorganisms, such as specialized fungi that attack and control plant pathogens and the diseases.

Key words: Antibiotic, bio-fungicide, seed borne, wheat

Introduction

Antibiosis – the bio-fungicide produces a chemical compound such as an antibiotic or other toxin that kills the target organism. Because of their specificity of action against plant pathogens, relatively low phytotoxicity, absorption through foliage and systemic translocation and activity in low concentration, the use of antibiotic is becoming very popular and very effectively used in managing several plant diseases.

Antibiosis is defined as the inhibition or destruction of the microorganism by substances such as specific or nonspecific metabolites or by the production of anti-biotic that inhibit the growth of another microorganism (Benitez et al., 2004; Irtwange, 2006; Viterbo et al., 2007; Haggag and Mohamed, 2007).

Aureofungin is a systemic antifungal antibiotic research product of H.A. Ltd. It is the only Antifungal Antibiotic in the market. Aureofungin is used for seed treatment as well as for sprays. It is also used for root application. It is either used alone for fungal diseases, control or combined with streptocycline when bacterial diseases control is needed.

Seed-borne diseases can seriously affect crop yield and quality. The most effective means of control is by exclusion and reduction of the inoculum during seed production (Van der. et al 2008). Seed-borne diseases have been found to affect the growth and productivity of crop plants (Kubiak & Korbas, 1999; Weber et al., 2001; Dawson & Bateman, 2001). Seed-borne mycoflora of wheat reported recently included Alternaria alternata, Drechlera sorokiniana, Fusarium moniliforme, F. avenaceum, F. graminearum, F. nivale, F. culmorum, F. equiseti, F. sporotrichioides, Cladosporium herbarum, Stemphylium botryosum (Nirenberg et al., 1994; Glazek, 1997; Mirza & Qureshi, 1978).

Bio-fungicide means fungicides of biological origin. It may be microorganism such as bacteria, fungi and animal or plant based product like secondary metabolite. Indian economy is dependent upon agriculture and agriculture has major problems of fungal diseases. Fungi
can cause serious damage in agriculture, resulting in critical losses of yield, quality and profit (Choudhary et al., 2014).

The present investigation has been undertaken to effect of antibiotic and bio-fungicide for control of seed borne fungi of wheat with emphasis for further controlling of seed borne fungi using antibiotic and bio-fungicide.

**Material and Methods**

The present studies were carried out at Bhargava Agricultural Botany laboratory, Department of Botany University of Allahabad, Allahabad, Uttar Pradesh, India, during Nov. to April 2015-2016 for effect of antibiotic and bio-fungicide for control of seed borne fungi of wheat.

**Collection of seed samples**

Seed samples were collected from different seed corporations, companies and farmer’s seed lots from two districts Allahabad. Then these were properly labelled, kept in polythene bags and stored for further studies in a freezer at 10 °C until mycological testing and other processing Fernandez et al., 1985. 10 varieties have been selected, each variety 10 seeds taken in the experiment. Seeds were disinfected with chlorox 1% for 1-2 minutes and then washed three times with distilled water Mittal et al., 1999.

**Agar plate method:**

Agar plate method (Agrawal 1976) as suggested by International Seed Testing Association (ISTA 2005) was used for the detection of fungi. And isolation, seeds were incubated on Agar plates (Anonymous, 1993). Potato dextrose agar (PDA) was used in this method for the isolation of mycoflora. 10 seeds per plate were inoculated and incubated at 22 ± 2 °C. After 7 days incubated seeds were examined under steriobinocular microscope for fungi and then the isolated mycoflora were sub-cultured by single spore technique for macro and microscopic studies.

**Identification of fungi**

Fungal morphology was identified on the basis of colony characteristics and microscopic examinations. Standard books and research papers were consulted during the examination of these fungi (Aneja, 2004; Rifai, 1969; Barnett and Hunter, 1999). The fungi were identified with the help of keys, monographs and text provided by several authors Barnett and Hunter, 1972; Pedro et al., 2009.

**Procedure of treatments**

The experiment includes three treatments were evaluated each 10 seeds tested with three replications in pot a randomized experimental arrangement and also each 100 seeds tested with three replications in plot. Indra (K-8962) variety of wheat has been taken as test selected to 3.06 × 2.07 meter plot with plant to plant distance 18 cm and row to row 23 cm. (Seth, et.al. 2014). The treatments were respectively applied:- $T_1 = \text{Control}$, $T_2 = 3.500 \text{ gm Aureofungin}$ with 100 ml water (Antibiotic) at 4 hour for 100 dipping seeds, $T_3 = \text{Allium}$...
 sativum leaf extract with cow urine (Bio-fungicide), the wheat seeds were treated from leaf extract of Allium sativum with cow urine, dipping seeds in 1:2 ratio preparations (Seth, et.al. 2015). Control percentage and disease incidence of fungal was calculated by applying this formula:-

$$\text{Control} \% = \frac{\text{Maximum infected seed} - \text{Minimum infected seed}}{\text{Maximum infected seed}} \times 100$$

$$\text{Disease Incidence} \% = \frac{\text{No. of Infected of plant}}{\text{Total No. of plant}} \times 100$$

Results and Discussion
In the experiment, the different two treatments applied for control of seed borne fungi of wheat in the pots. The result was obtained control 63.20 %, and disease incidence 23.30 % were recorded from Allium sativum leaf extract with cow urine (Bio-fungicide) in the T3 whereas control 47.41% and disease incidence 33.33% were recorded from 4 gm. Aureofungin with 100 water (Antibiotic) in the T2 (Table 1).

Table: 1 Control of seed borne fungi of wheat by different seed treatment in pots

| Treatment | Total No. of plant | No. of infected seed in Pots | Mean ±SD | D.I.% | Control % |
|-----------|--------------------|-----------------------------|----------|-------|-----------|
|           |                    | P1  | P2  | P3  |          |           |           |
| T1        | 10                 | 6   | 7   | 6   | 6.33±0.57 | 63.33     | 0.00      |
| T2        | 10                 | 3   | 2   | 3   | 3.33±0.57 | 33.30     | 47.41     |
| T3        | 10                 | 2   | 1   | 2   | 2.33±0.57 | 23.30     | 63.20     |

The different two treatments also applied for control of seed borne fungi of wheat in the plots. The result was obtained control 68.75 %, and disease incidence 20 % were recorded from Allium sativum leaf extract with cow urine (Bio-fungicide) in the T3 whereas control 52.09 % and disease incidence 30.66 % were recorded from 4 gm. Aureofungin with 100 ml water (Antibiotic) in the T2 (Table 2).

Table: 2 Control of seed borne fungi of wheat by different seed treatment in plots

| Treatment | Total No. of plant | No. of infected seed in Plot | Mean ±SD | D.I.% | Control % |
|-----------|--------------------|------------------------------|----------|-------|-----------|
|           |                    | P1  | P2  | P3  |          |           |           |
| T1        | 100                | 62  | 66  | 64  | 64.00±2.00 | 64.00     | 0.00      |
| T2        | 100                | 32  | 30  | 30  | 30.66±1.15 | 30.66     | 52.09     |
| T3        | 100                | 22  | 18  | 20  | 20.00±2.00 | 20.00     | 68.75     |
It had been observed that the percent disease had been increased under control treatment, while the treated plants were found to have reduced disease per plant. Tests with wheat bunt were also successful, although the seed was injured. In a later paper, workers at the same station reported obtaining control of bunt with cycloheximide by means of a 1-minute soaking period, or with dust treatments Henry et al. (1952). Griseofulvin as a antibiotics is very effective in controlling powdery mildew of wheat, Piricularia oryzae, Ascochyta pisi (Wallen et al. 1965) and silver-leaf disease in plums (Bennett, 1962). Its efficacy has been summarized by Rhodes (1962). Mycostatin (nystatin) has successfully been used as post-harvest dip-treatment against peach decay (Dimarko & Davis, 1957). Seed was treatment antibiotic of aureofungin on Rhizobium strain of groundnut (Mukewar et al 1969). The treatments of bio-fungicide significantly control percent of seed borne fungi of wheat. They worked on controlling the bacterial leaf blight disease of mango and found bio-fungicide as an effective control measure. The findings of the present study have been supported by Chowdhury (2009) and Akter (2011). The findings of the present study have been supported by Sathe (2011) as she also found bio-fungicide an effective control measure against Bacterial leaf blight disease of litchi.

**Conclusion**

*Allium sativum* leaf extract with cow urine (Bio-fungicide) was found superior in controlling of seed borne fungi of wheat compare than Aureofungin with 100 ml water (Antibiotic). A bio-fungicide is composed of beneficial microorganisms, such as specialized fungi that attack and control plant pathogens and the diseases.

**Reference**

1. Agarwal, V.K (1976). Techniques for the detection of seed borne fungi. *Seed Research*, 4: 24-31.
2. Akter H (2011). Management of nursery diseases of Banana and Mango. MS. Thesis. Department of Plant Pathology, Bangladesh Agricultural University, Mymensingh. pp 60.
3. Aneja KR (2004). Experiments in Microbiology, Plant Pathology and Biotechnology. Fourth edition, *New International (P) limited publishers*, India.121-128.
4. Anonymous. (1993). International rules for seed testing. *Seed Science & Technol.*, 21:1-288.
5. Barnet HL, BB Hunter (1999). Illustrated genera of imperfect fungi. *The American Psychopathological society*, U.S.A.
6. Barnett HL, Hunter BB (1972). Illustrated Genera of Imperfect Fungi. Burgess Pub. *Co., Minneapolis*, Minnesota. p. 241.
7. Benítez, T., Rincón, M.A., Limón, M.C. and Codón, C.A. (2004). Bio-control mechanisms of Trichoderma strains. *International microbiology* 7: 249-260.
8. Bennett, M. (1962). An approach to the chemotherapy of silver leaf disease (*Stereum purpureum* Fr.) of plum trees. *Ann. appl. Bioi.* 50, 515-524.
9. Choudhary DK., Verma SK, Patel AK and Dayaram (2014). Formulation and development of bio-fungicide. *International Research Journal of Natural Sciences* Vol. 2, No.2, pp.14-22.
10. Chowdhury, M.S.M. (2009). Seed and seedling diseases of some selected fruits of Bangladesh. Ph. D. Thesis. Department of Plant Pathology, Bangladesh Agricultural University, Mymensingh. pp. 97-124.

11. Dawson, W.A.J.M. and G.L. Bateman. (2001). Fungal communities on roots of wheat and barley and effects of seed treatments containing fluquinconazole applied to control take-all. *Plant Pathology*, 50: 5-82.

12. Dimarko, G. R. & Davis, B. H. (1957) Prevention of decay of peaches with postharvest treatment. *Pl. Dis. Repr.* 41, 284-288.

13. Glazek, M. (1997). Mycoflora of winter wheat seeds harvested from flooded commercial fields in South-Western Poland in 1997. Plant Protection Institute in Poznaniu, Sosnicowice Branch, Gliwicka St. *Sosnicowice, Poland.* 29:44-153.

14. Haggag, W.M. and Mohamed, H.A.A. (2007). Biotechnological aspects of microorganisms used in plant biological control. *American-Eurasian Journal of Sustainable Agriculture* 1: 7-12.

15. Henry, A. W., Millar R. L., and Peterson, E. A., (1952). *Science,* 115, 90-1

16. Hindustan antibiotics limited pimpri, pune - 411 018 (A Govt. of India Undertaking).

17. Irtwange, V.S. (2006). Application of biological control agents in pre- and postharvest operations. Agricultural Engineering International: the CIGRE E journal. Invited Overview 3: 1-12.

18.ISTA. (2005). Seed Health Testing Methods and The Germination Test. In. International Rules for Seed Testing. Pub. By *Intl. Seed Test.Assoc.* Bassersdorf, Switzerland.

19. Kubiak K. and M. Korbas. (1999). Occurrence of fungal diseases on selected winter wheat cultivars. *Postepy w Ochronie Roslin* 39 (2), 801-804 [in Polish].

20. Mirza, J.H. and M.S.A. Qureshi. (1978). Fungi of Pakistan. University of Agric., Faisalabad. Pakistan.

21. Mittal, R.K., H.J. Hansen, K. Thomsen, M. Marzialina de, K.C. Khoo de, N. Javanthi de, K.F.Y. Tsna de, and B. Krishnapillav. (1999). Effect of seed treatments and storage temperature on storability of Syzgium cuminii seeds. TUFRO Seed Symposium Recalcitrant seeds, *Proceedings of the Conference Kaula Lampur Malaysia,* 12 -15 Oct 1998-99.30(1): 53-63.

22. Mukewar PM, Bhide VP. (1969). Effect of seed treatment with fungicides and antibiotic aureofungin on the efficacy of nodulation by *Rhizobium* strain of groundnut. *Hindustan Antibiotics Bulletin.* Feb; 11(3): 172-6

23. Nirenberg, H., H. Schmitz-Elsherif, C.I. Kling. (1994). Occurrence of Fusaria and some “blackening moulds” on durum wheat in Germany. 1. Incidence of *Fusarium* species. *Pflanzenkrankheiten und Pflanzenschutz,* 101: 449-459.

24. Pedro, W.C., J.M. Verkley, J.Z. Groenewald and R.A. Samson. (2009). Fungal Biodiversity. Pub. Co. CBSKNAW Fungal Biodiversity centre Utrecht, The Netherlands. *Phytopathol.,* 149: 185-188.

25. Rhodes, A. (1962). Status of griseofulvin in crop protection. *Proc. Eastern Sch. agric. Sci. Univ. Nott.* 9, 101-124.

26. Rifai M.A (1969). Revision of the genus *Fusarium and Alternaria.* *Mycological papers* 116:40-95.
27. Sathe MSN 2011: Management of nursery diseases of guava and litchi. MS. Thesis. Department of Plant Pathology, Bangladesh Agricultural University Mymensingh. pp. 1-2, 21.

28. Seth RK & Alam Shah (2015). Indigenous Methods: Control of Septoria Leaf Blotch of Wheat. *International Journal of Agriculture Sciences*, ISSN: 0975-3710 & E-ISSN: 0975-9107, Volume 7, Issue 13, pp.-822-823.

29. Seth RK, Shah A, Shukla DN (2014). Screening of disease resistant varieties against loose smut of wheat. *J. Nat. Prod. Plant Res.* 4(5):49-54.

30. Van der Wolf, J.M., Bimbaum, Y., van der Zouwen, P.S. and Groot, S.P.C. (2008), *Seed Sci. & Technol.*, 36, 76-88

31. Viterbo, A., Inbar, J., Hadar, Y. and Chet, I. (2007). Plant disease biocontrol and induced resistance via fungal mycoparasites. In: Environmental and Microbial Relationships, 2nd edn. The Mycota IV. (eds. C.P. Kubicek and I.S. Druzhinina). Springer-Verlag Berlin Heidelberg: 127-146.

32. Wallen, V. R. (1965). Field tvaluations and the importance of Ascochyta complex on peas. *Can. J. Pl. Sci.* 45, 27-33.

33. Weber, R., B. Hrynczuk, B. Runowska-Hrynczuk and W. Kita. (2001). Influence of the mode of tillage on diseases of culm base in some winter wheat varieties, oats, and spring wheat. *J. Phytopathol.*, 149: 185-188.