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Study on Prevalence and Most Widespread Wheat Seed Borne Mycoflora in Different Locations of Samastipur

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***Abstract* — In India, Wheat is the most stable crop placed second only to rice. In Samastipur, as compared to other commercial crop, wheat is grown on more land area. However in addition to declining in the physical-chemical quality of seed grains, fungi also affect the seeds germ inability. Keeping this in mind, it has been decided to make a through survey of wheat varieties collected from different localities of Samastipur district. In the present study, Wheat samples were collected from different locations of Samastipur and then determined the presence of fungal pathogens which may be associated with wheat seeds. In this study, thirty seed samples were collected and presence of fungal pathogen was determined by blotter method. At the end of the study we found that *Fusarium graminearum* were predominant among all the varieties and was strongly pathogenic. *Fusarium graminearum*is a species of toxigenic fungi that is capable of producing trichothecene is found throughout the world. Percentage frequency was determined and type of fungi varied with variety and locations. *Fusarium graminearum* was highest in Samastipur district while *Fusarium poae* was found next to *Fusarium graminearum.* Relative humidity might be the reason for variation in frequency and type of fungi detected in wheat seeds at different locations.**

***Keywords* — Agriculture, Crop, Fungi, Wheat Seeds, Pathogens.**

I. INTRODUCTION

Agriculture is the chief economic occupation of the Samastipur district and approximately eighty three percentage of the entire working population depends on it. Samastipur is one of the most significant food grain producing regions of India. Wheat is the most essential food grain source for humans and is grown on more land area than any other commercial crop. Productivity of Wheat in Samastipur increased rapidly and was computed to be around 2872 kg/hectare in the last report by the Indian department of agriculture (Agricultural statistics at a Glance 2014-2015).

Being a plant, pests and diseases have always been a problem. Along with the deterioration in the physical chemical quality of seed grains, germ inability of seeds is also affected by fungi [1].

There are quite a lot of limiting factors which may affects the wheat yield. In the middle of them frequency of diseases and their poor management is the main factors [2]. Wheat seed is the carrier of pathogens.

Seeds which are infected by pathogens may survive and grow to become a source of prime inoculums in the next generation. It may results in seed necrosis, seed abortion, elimination of germination and also may cause seedling damage resulting in progression of disease state by systemic or local infections [3].

Fungal species which are capable of producing mycotoxins and seed borne fungi isolated from wheat seeds were *Aspergillus sp., A. niger, A. candidus, A. flavus, A. sulphureus, Fusarium moniliforme, F. sporotichoides, F. graminearum, F. poae, F. subglutinans, F. oxysporum, F. pallidoroseum, Rhizoctoniasolani and Rhizopus sp., Penicillium spp.*[4]. Nutritional composition and quality of wheat are decreased by fungal infection. To avoid epidemics and for timely management of disease, it is essential to identify the seed borne pathogens in the early hours.

The intention of testing the quality of seeds is to identify the healthy seeds that can be sown in the field, which eventually results in production of healthy seed crops, and improved yields in terms of quality and quantity. It is also necessary to carry out testing of seed health to verify the spread of seed borne diseases to new areas. The exchanges of germplasm are essential for the process in crop improvement programs, but the movement of germplasm may also result in spread of diseases [5]. The aim of the present study was to identify fungi prevailing in the seeds of wheat used commonly in Samastipur.

II. MATERIALS AND METHODS

This study was carried out in the period of September to December, 2014 in Lalit Narayan Mithila University, Darbhanga. Samples (30) of wheat were collected from different localities of Samastipur. 200 grams each of 30 samples of wheat were collected from research institutes for the study. Seed borne fungi was isolated and identified by blotters method described by International Seed Testing Association [6]. After sterilization, seeds were placed in the properly labeled petri-dishes in equidistance. The petri-dishes were then incubated at 20 °C under alternate cycles of 12 hours light and dark. After incubation, the seeds were observed on day fifth, seventh and on ninth day. Stereo binocular microscope was used for presence/absence of fungi and binocular, compound microscope was used for identification of fungi. Identification was done based on morphology of spores and mycelia as described by Mathur and Kongsdal [6]. Percent frequency (PF) of fungi was calculated by using the following formula [7].

$$PF = \frac{\text{No. of seeds on which fungus appears}}{\text{Total number of seeds}} \times 100$$

III. Results and Discussion

The study identified twelve species of fungi in samples of wheat seeds. Percentage frequency was determined and type of fungi varied with variety and locations.

Fusarium graminearum was highest in Samastipur district while *Fusarium poae* was found next to *Fusarium graminearum. Cladosporium herbarum* was also found on seeds. Clear and Patrick'can (1993) reported 35 fungal genera with 59 species from wheat grain samples with the important genera *Alternaria, Bipolaris sorokiniana, Fusarium graminearum, Aspergillus, Cladosporium, Epicoccum, Nigrospora* and *Septorianodorum* [8].

In HD 2824, lowest percentage frequency was found and highest percentage frequency was found in K 9107. A number of fungi found to be associated with wheat seeds collected from various locations. Frequency of *Bipolaris sorokiniana* appeared lowest in some areas while in other areas frequency of *Bipolaris sorokiniana* was high. The results showed that some areas of Samastipur were also infected with *Bipolaris sorokiniana* and are not safe with regards to the pathogens. Elevated frequency of *Fusarium graminearum* would be due to temperature and relative humidity. It was reported that high temperature and high relative humidity may results in the spot blotch disease [9]. Alam and Saha (1991) reported that infection occurs because of prolonged wet weather just prior to the harvest or because of high relative humidity with frequent rains [10]. Pickett and Pruitt (2010) reported that constant cultivation of the similar kind ofcrop directs the intensification of pathogens [11].

In case of storage fungi, frequency of *Aspergillus flavus* was high in some locations and slight at other locations. This is a sign of storage condition in which seeds are reserved. Bashir and Kutama (2012) reported that frequency of storage fungi could be due to poor means of storage (i.e. high temperature and high RH) or because of contaminated farm equipments [12]. *Epicoccum nigrum, Bipolaris spicifera, Stemphylium botryosum, Cladosporium herbarum, Curvularia lunata, Ulocladium sp., Acremonium strictum, Alternaria longissima and Trichothecium sp.* are weak parasitic and saprophytic fungi. The majority of these fungi cause sooty head molds. Hershman (2011) reported that wet and humid weather in the later stages of grain development and crop maturation results in growth of head mold fungi on senescing and may damaged wheat heads [13]. Use of high fertilizer rates may also augment grain infection by *Fusarium* and *Penicillum* species. Taking away the previous crop straw from the fields facilitates to reduce the fungal infection in cereals [14]. The majority of seed borne fungal disease of wheat were *Fusarium* head blight (aggravated by *Fusarium* spp.), Helminthosporium leaf of blight (caused by *Bipolaris sorokiniana* and *Pyrenophora triticirepentis*), and Black point/smudge (caused by *Fusarium, Alternaria, Aspergillus, Cochliobolus, Cladosporium, Penicillium, Rhizopus* and *Stemphylium*) [15].

IV. Conclusion

In Samastipur, Wheat seeds found to be associated with fungi, but their presence or absence varied with varieties and locations. The study indicated that wheat seeds should be produced in areas with relatively lower temperature and relative humidity for low seed infection with fungi.

References

[1] N. Saxena, S.K.. Shiva Rani, and M. Deepika. Bio deterioration of Soybean (*Glycine max* L.) seeds during storage by Fungi. *Int. J. Curr. Microbiol. App. Sci* 2015. 4(6): 1118-1126.

[2] M. Donatelli, R.D. Magarey, S. Bregaglio, L. Willocquet, J.P.M. Whish, and S. Savary. Modelling the impacts of pests and diseases on agricultural systems. *Agric Syst.* 2017. 155: 213–224. [doi: 10.1016/j.agsy.2017.01.019PMCID: PMC5485649 PMID: 28701814]

[3] M. Zafar, A. Jamal, R. Tahira, M. Zakria, M. Naeemullah. Incidence of Seed-Borne Mycoflora in Wheat and Rice Germplasm. *International Journal of Agriculture Innovations and Research* 2014. 2(5): 2319-1473

[4] M. H. Hashmi Fakhrunnisa, and A. Ghaffar. Seed-bornemycoflora of wheat, sorghum and barley. *Pakistan Journal of Botany*. 2006. 38: 185-192.

[5] J. Koskela, B. Vinceti, W. Dvorak, D. Bush, I. K. Dawson, J. Loo, E. DahlKjaer, C. Navarro, C. Padolina, S. Bordács, R. Jamnadass, L. Graudal, L. Ramamonjisoa. Utilization and transfer of forest genetic resources: A global review. *Forest Ecology and Management* 2014. 333: 22-34.

[6] S.B. Mathur, O. Kongsdal. Common laboratory seed health testing methods for detecting fungi (1sted). *ISTA*. 2003.

[7] S.D.Y. Naqvi, T. Shiden, W. Merhawi, S. Mehret. Identification of seed borne fungi on farmer saved sorghum (*Sorghum bicolor* L.), pearl millet (*Pennisetum glaucum* L.) and groundnut (*Arachis hypogaea* L.) seeds. *Agr. Sci. Res.* J.2013. 3: 107-114.

[8] R.M. Clear, and S.K. Patrick'Can. Prevalence of some seed borne fungi on soft white winter wheat seed from Ontario, Canada. *Plant Disease Survey*. 1993. 73: 143-149.

[9] E. E. Saari. Leaf blight disease and associated soil borne fungal pathogens of wheat in South and Southeast Asia. In: Duveiller E, Dubin HJ, Reeves J, McNabA (ed.) Helminthosporium Blights of Wheat: Spot Blotch and TanSpot. CIMMYT, Mexico D.F. 1998. pp. 37-51.

[10] K.B. Alam, N.K. Saha. Helminthosporium leaf blight of wheat a new problem in Bangladesh. Paper presented at international Workshop on Helminthosporium blight. CIMMYT, Mexico, D. F. 1991. 12 pages.

[11] L.S. Pickett, J.D. Pruitt. Non-chemical methods for controlling diseases in the home landscape and garden. Oklahoma cooperative extension fact sheets available on website: *http://osufacts.okstate.edu* 2010.

[12] M. Bashir, M.A. Mani, A.S. Kutama. Seed-borne mycoflora of local and improved wheat (*Triticumaestivum* L.) cultivars in Kano, Nigeria. *Bayero Journal of Pure and Applied Sciences*. 2012. 5: 101–103.

[13] D. E. Hershman, 2011. Black "sooty" head mold of wheat. University of Kentucky. *Plant Pathology Fact Sheet*.

[14] S. Suproniene, A. Mankeviciene, G. Kadziene. 2011. The effect of different tillage-fertilization practices on the mycoflora of wheat grains. *Agricultural and Food Science*. 20:315-326.

[15] J.D. Salgado, M. Wallhead, L.V. Madden, P.A. Paul. Grain harvesting strategies to minimize grain quality losses due to Fusarium head blight in wheat. *Plant Dis.* 2011.95: 1448-1457.

Table 1. List of wheat varieties collected from different locations.

Cultural conditions	Varieties
Irrigated timely sown	HD 2967, K 9107, HD 2824, PBW 343, 502,
Irrigated late sown	HD 2824, HP 1633 (Sonali),
Irrigated very late sown	HD 2285, Raj 3765, UP 262, 2425
Rainfed timely sown	K 8027, C 306,
Rainfed late sown	HDR 77, K 8962 (Indra),
Salt affected soils	Raj 3077, KRL 19,

Table 2. Percantage frequency of fungi in seeds of seventeen wheat varieties

Varieties	FG	FP	CH	BS	AA	AF	RS	CL	EN	BiS	FM	PS	MEAN
HD 2824	10.75	8.25	4.8	8.25	3.15	2.5	0	1.6	1.8	1.1	0	0	3.52
HD 2967	18.25	16.45	8	6	1.51	2.5	1.2	0	0	0	0	0	4.49
UP 262	14.26	11.25	7.26	6.21	5.5	3.4	2.28	0	0	0.25	0	0	4.20
PBW 343	16.2	28.22	11.23	8.8	2.26	2.23	0	0	0	0	0	0	5.75
PBW 502	25.85	8.26	5.59	6.9	6.98	3.32	2.25	3.75	0.75	0	0	0	5.30
HD 2824	24	17.75	6.25	7.5	4.5	1.25	6.75	0.5	0	0	0	0.25	5.73
HP 1633	35.22	22.2	2.28	1.2	7.25	1.3	0	1.5	0	0	0	0	5.91
HP 2285	28	29.25	10.25	9.82	1.25	2	1.2	0	0	0	0.75	0	6.68
Raj 3765	31.25	19.85	8.5	7.8	4.25	3.25	1.25	0	1.25	0.25	0	0	6.47
KRL 19	33.25	20.36	10.23	6.85	3.25	2.25	2.2	0	1.5	0.5	0	0	6.70
UP 2425	34.25	18.25	7	5	0.5	1	0	0	0	0	0	0	5.50
K 8027	25.26	22.2	9	5.25	4.5	2.5	0	0	0	0.25	0	0	5.75
C 306	17	30	11.25	10.25	2	0	0	0	0	0	0	0	5.88
HDR 77	25.25	15.23	7.5	8	7.28	5.25	0	3.75	0.75	0	0	0	6.08
K 8962	25	18.25	5.25	8.5	5.5	2.25	7.75	2.5	0	0	0	0.25	6.27
Raj 3077	44.35	30	6	0	9.5	0	0	1.5	0	0	0	0	7.61
K 9107	40.25	25.6	9.5	4	8.75	3	0	0.75	2.5	0	0	0	7.86

AA: *Alternaria alternate*, BS: *Bipolarissorokiniana*, RS: *Rhizopus spp.,* AF: *Aspergillusflavus,* BiS: *Bipolarisspicifera*, CL: *Curvularialunata*, PS: *Penicillium spp*., EN: *Epicoccumnigrum*, AN: *Aspergillusniger*, FM: *Fusariummoniliforme,* CH: *Cladosporiumherbarum,* FG: *Fusariumgraminearum,* FP: *Fusariumpoae.*