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EVALUATION OF AFLATOXIN CONTAMINATION IN GROUNDNUT FROM NANDURBAR DISTRICT OF MAHARASHTRA, INDIA.

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ABSTRACT:
Aflatoxins are the type of mycotoxins, which are derived from the fungi and affect human health. Usually, aflatoxins in Groundnut are produced by *Aspergillus flavus*, and *Aspergillus parasiticus*. To assess the problem of aflatoxin awareness among farmers, a survey was conducted at the end of rainy season in 2017 across the major ground nut growing 30 villages of Nadurbar, Navapur, Shahada, Taloda, Akkalkuwa and Dhadgaon tehsils from Nandurbar district. In the present investigation seed infection studies revealed that of the 60 samples, 06 had no infection, 7 had 10% infection, 12 had 15% infection, 11 had 20% infection, 13 had 25 % infection, 11 had more than 30 % infection. The results of soil analysis revealed that of 60 samples, 03 had no infection, 11 had 1 x 10^3 to 5 x 10^3 , 12 had 6 x 10^3 to 10 x 10^3 , 13 had 11 x 10^3 to 15x 10^3 21 had more than 16000 cfu g^{-1}
Key words: Aflatoxins, *Aspergillus*, Ground nut, Nandurbar.

INTRODUCTION:

Contamination of Aflatoxins occurs at any stage from field to storage, whenever environmental conditions are conducive for fungi. The fungi are generally regarded as storage fungi, which grow under conditions of relatively high moisture/humidity. It has been reported to cause liver damage and both liver and intestinal cancer in humans.

Groundnut is one of the crops, which is vulnerable to attack of aflatoxin. Aflatoxin may grow on Groundnut kernels, if the moisture content is above 8 to 9 percent. Aflatoxin contamination of Groundnut is a major health hazard to human and animals. The main reason for the contamination in Groundnut is due to poor pre-harvest and post-harvest practices like moisture stressed crop, stacking the pods/kernels in high humid conditions, which leads to growth of the fungus. Prevalence of aflatoxin contamination in groundnut has been high lightened by Desai *et al.*, 1991, Kumar *et al.,* 2001, Srilaxmi *et al.,* 2001, Waliyar, F. 2006, Yeole and Deshmukh 2013, Teja *et al.*, 2017. Although considerable research information has been gathered from various regions of India, a little is known from the Nandurbar district of Maharashtra is concerning to seed and soil borne fungi.

MATERIALS AND METHODS :

The submerged leaves and foam samples were To assess the problem of aflatoxin awareness among farmers, a survey was conducted at the end of rainy season in 2017 across the major ground nut growing 30 villages from six tehsils of Nandurbar district. Information was obtained by closely interacting with farmers on crop details and awareness on aflatoxin contamination.

Pod and soil sampling:

A stratified sampling method was followed to collect sample. From each village 2 pod samples (500 gm pods per sample) and two soil samples (250 gm per sample) were collected.

Pod samples were collected randomly from 2 spots in each field from mature/harvested plants in the field and bulked. The soil in the geocarposhere region from the same spots was collected and pooled to make a bulk sample. 60 pod samples and 60 soil samples collected from 30 villages of each tehsils belongs to Nandurbar district. Each sample was packed in polythine bag and sealed well with rubber band to prevent loss of moisture and transported to the laboratory.

Analysis for seed infection and soil population of *A. flavus:*

Pods were shelled and the seeds were surface sterilized before planting them on Czapek Dox agar (CDA) fortified with rose Bengal, and incubated at 25° C for 4 days in dark for determining seed infection. For each sample, 20 apparently healthy seeds were used. Number of seeds colonized by typical *A. flavus* was counted and percentage seed infection determined. Soil samples were sieved to fine powder and serially diluted in sterilized distilled water to 10^3 concentrations and plated on AFPA (*Aspergillus flavus* and *parasiticus agar*) medium (Pitt *et al.,*

1983). The plates were incubated for two days at 28˚C in dark. Typical *A. flavus* colonies were identified with the help of Barnett and Hunter 1972, Barnet and Hunter 1998, Nagmani *et al.,* 2006 and other relevant literature. Colonies were counted and population density determined as colony forming units (cfu) g^{-1} of soil.

Formula for CFU g^{-1} :

Total number of microbes =Dilution factor x number of colonies

Distribution in India: Maharashtra, Uttarakhand, Karnataka, Kerala, and Andhra Pradesh (see Borse et al. 2016, 2017).

RESULT & DISCUSSION :

In the present investigation seed infection studies revealed that of the 60 samples, 06 had no infection, 7 had 10% infection, 12 had 15% infection, 11 had 20% infection, 13 had 25 % infection, 11 had more than 30 % infection. The results of soil analysis revealed that of 60 samples, 03 had no infection, 11 had 1 x 10^3 to 5 x 10^3 , 12 had 6 x 10^3 to 10 x 10^3 , 13 had 11 x 10^3 to 15x 10^3 21 had more than 16000 cfu g^{-1}

It is evident from results presented in table -1 that, out of 10 seed samples 02 had no infection, 0 had 10% infection, 2 had 15% infection, 1 had 20% infection, 3 had 25 % infection, 2 had more than 30 % infection. The results of soil analysis revealed that of 10 samples, 0 had no infection, 2 had 1 x 103 to 5 x 103 , 3 had 6 x 103 to 10 x 103 , 2 had 11 x 103 to 15x 103 and 03 had more than 16000 cfu g-1

It is evident from results presented in table -2 that, out of 10 seed samples 02 had no infection, 1 had 10% infection, 2 had 15% infection, 2 had 20% infection, 2 had 25 % infection, 1 had more than 30 % infection. The results of soil analysis revealed that of 10 samples, 1 had no infection, 3 had 1 x 10^3 to 5 x 10^3 , 0 had 6 x 10^3 to 10 x 10^3 , 1 had 11 x 10^3 to 15x 10^3 and 5 had more than 16000 cfu g^{-1}

It is evident from results presented in table -3 that, out of 10 seed samples 0 had no infection, 1 had 10% infection, 0 had 15% infection, 3 had 20% infection, 2 had 25 % infection, 4 had more than 30 % infection. The results of soil analysis revealed that of 10 samples, 1 had no infection, 0 had 1 x 10^3 to 5 x 10^3 , 1 had 6 x 10^3 to 10 x 10^3 , 3 had 11 x 10^3 to 15x 10^3 and 5 had more than 16000 cfu g^{-1}

It is evident from results presented in table -4 that, out of 10 seed samples 2 had no infection, 2 had 10% infection, 2 had 15% infection, 1 had 20% infection, 2 had 25 % infection, 1 had more than 30 % infection. The results of soil analysis revealed that of 10 samples, 1 had no infection, 1 had 1 x 10^3 to 5 x 10^3 , 4 had 6 x 10^3 to 10 x 10^3 , 2 had 11 x 10^3 to 15x 10^3 and 2 had more than 16000 cfu g^{-1}

It is evident from results presented in table -5 that, out of 10 seed samples 0 had no infection, 2 had 10% infection, 3 had 15% infection, 2 had 20% infection, 2 had 25 % infection, 1 had more than 30 % infection. The results of soil analysis revealed that of 10 samples, 0 had no infection, 3 had 1 x 10^3 to 5 x 10^3 , 2 had 6 x 10^3 to 10 x 10^3 , 3 had 11 x 10^3 to 15x 10^3 and 2 had more than 16000 cfu g^{-1}

It is evident from results presented in table -6 that, out of 10 seed samples 0 had no infection, 1 had 10% infection, 3 had 15% infection, 2 had 20% infection, 2 had 25 % infection, 2 had more than 30 % infection. The results of soil analysis revealed that of 10 samples, 0 had no infection, 1 had 1 x 10^3 to 5 x 10^3 , 2 had 6 x 10^3 to 10 x 10^3 , 3 had 11 x 10^3 to 15x 10^3 and 4 had more than 16000 cfu g^{-1}

CONCLUSION:

In general there was no clear correlation between *A. flavus* soil population density and seed infection among samples. From these preliminary results Bhaler, Aslod, Borale, Toloda(R), Aamli, Chandsali And Ghodamb villages were identified with relatively higher population density of *A. flavus* and higher seed infection, thus likely to be aflatoxin risk prone areas. However these results need confirmation from pod and soil samples and aflatoxin estimation in seed samples during the next coming years.

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Table1 showing % seed infection and soil population of *A.flavus* from Nandurbar tehsil.

Name of Village	Locality I				Locality II			
	No. of infected seeds	seed infection (%)	No. of colonies	*A. flavus* population cfu g^{-1}	No. of infected seeds	seed infection (%)	No. of colonies	*A. flavus* population Cfu g^{-1}
1.Arale	03	15	11	11000	03	15	09	9000
2.Bhaler	06	30	24	24000	05	25	15	15000
3.Borale	05	25	21	21000	07	35	18	18000
4.Ghotane	-	-	01	1000	-	-	01	1000
5.Natawad	05	25	06	6000	04	20	07	7000

Table 2 showing % seed infection and soil population of *A.flavus* from Navapur tehsil.

Name of Village	Locality I				Locality II			
	No. of infected seeds	seed infection (%)	No. of colonies	*A. flavus* population cfu g^{-1}	No. of infected seeds	seed infection (%)	No. of colonies	*A. flavus* population Cfu g^{-1}
1. Borzar	**06**	**30**	**19**	**19000**	**04**	**20**	**17**	**17000**
2. Dudhave	**02**	**10**	**05**	**5000**	**03**	**15**	**05**	**5000**
3.Navagao	**05**	**25**	**17**	**17000**	**04**	**20**	**18**	**18000**
4.Nagare	**03**	**15**	**12**	**12000**	**05**	**25**	**16**	**16000**
5. Tarapur	**-**	**-**	**--**	**--**	**-**	**-**	**02**	**2000**

Table 2 showing % seed infection and soil population of *A.flavus* from Navapur tehsil.

Name of Village	Locality I				Locality II			
	No. of infected seeds	seed infection (%)	No. of colonies	*A. flavus* population cfu g^{-1}	No. of infected seeds	seed infection (%)	No. of colonies	*A. flavus* population Cfu g^{-1}
2. Borz	06	30	19	19000	04	20	17	17000
2. Dudhave	02	10	05	5000	03	15	05	5000
3.Navagao	05	25	17	17000	04	20	18	18000
4.Nagare	03	15	12	12000	05	25	16	16000
5. Tarapur	-	-	--	--	-	-	02	2000

Table 3 showing % seed infection and soil population of *A.flavus* from Shahada tehsil.

Name of Villag	Locality I				Locality II			
	No. of infected seeds	seed infection (%)	No. of colonies	*A. flavus* population cfu g^{-1}	No. of infected seeds	seed infection (%)	No. of colonies	*A. flavus* population Cfu g^{-1}
1.Aslod	07	35	26	26000	06	30	27	27000
2.Borale	06	30	22	22000	05	25	18	18000
3.Lonkheda	04	20	16	16000	04	20	13	13000
4 Pingane	05	25	12	12000	02	10	06	6000
5.Tikhore	04	20	-	-	06	30	13	13000

Table 4 showing % seed infection and soil population of *A.flavus* from Taloda Tehsil.

Name of Villag	Locality I				Locality II			
	No. of infected seeds	seed infection (%)	No. of colonies	*A. flavus* population cfu g^{-1}	No. of infected seeds	seed infection (%)	No. of colonies	*A. flavus* population Cfu g^{-1}
1.Borad	02	10	08	8000	03	15	09	9000
2. Dhanore	-	-	03	3000	-	-	-	-
3. Kothar	05	25	13	13000	04	20	12	12000
4.Rozve	03	15	09	9000	02	10	06	6000
5.Talode(R)	06	30	22	22000	05	25	19	19000

Table 5 showing % seed infection and soil population of *A.flavus* from Akkalkuwa Tehsil

Name of Villag	Locality I				Locality II			
	No. of infected seeds	seed infection (%)	No. of colonies	*A. flavus* population cfu g^{-1}	No. of infected seeds	seed infection (%)	No. of colonies	*A. flavus* population Cfu g^{-1}
1. Aamli	05	25	23	23000	06	30	24	24000
2 .Dab	02	10	10	10000	03	15	14	14000
3. Jamana	04	20	03	3000	02	10	06	6000
4 .Khapar	03	15	03	3000	03	15	03	3000
5. Wadfali	05	25	12	12000	04	20	13	13000

Table 6 showing % seed infection and soil population of *A.flavus* from Dhadgaon Tehsil

Name of Villag	Locality I				Locality II			
	No. of infected seeds	seed infection (%)	No. of colonie	*A. flavus* population cfu g^{-1}	No. of infected seeds	seed infection (%)	No. of colonies	*A. flavus* population Cfu g^{-1}
1.Chansaili	06	30	23	23000	07	35	28	28000
2.Ghodamba	04	20	11	11000	05	25	23	23000
3. Roshamal	03	15	08	8000	03	15	11	11000
4. Talai	05	25	18	18000	04	20	12	12000
5.Valkhedi	02	10	03	3000	03	15	08	8000