International Journal of
Life Sciences
International Peer Reviewed Open Access Refereed Journal

Int. J. of Life Sciences, 2021; 9 (1):97-102
ISSN:2320-7817(p) | 2320-964X(o)

Research Article Open Access

Study of *Aspergillus flavus* Producing Aflatoxin in Groundnut

Yeole RD

Department of Botany, Smt. G. G. Khadse College, Muktainagar , Dist. Jalgaon (425 306)
email–drrajendrayeole@yahoo.com

Manuscript details:

Received: 13.02.2020
Accepted: 04.03.2021
Published: 31.03.2021

Cite this article as:
Yeole RD (2021) Study of *Aspergillus flavus* Producing Aflatoxin in Groundnut, *Int. J. of Life Sciences*, 9 (1):97-102.

Available online on http://www.ijlsci.in
ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

ABSTRACT

To study the Aspergillus flavus producing aflatoxin in groundnut the groundnut samples are collected by survey method from villages of Muktainagar and Malkapur taluka. In all hundred groundnut samples collected from seven different places of Muktainagar and four places are from Malkapur taluka. All these hundred groundnut samples collected are of summer season produced. Among the hundred samples collected fourteen are from Naygaon, six each from Taroda and Muktainagar, forty from Talaswada, four from Siradon, ten from Malkapur and twenty are from Tandalwadi. All these hundred samples are categorized in three types producer, commercial and consumer depending upon their source of collection. The forty samples are found from producer, fifty seven from consumer and only three from commercial. Out of these hundred samples collected the only fifty seven belongings to consumer type collection, were incubated on Czapek-Dox Rose Bengal Agar medium and examined for the growth of percentage in terms of infection and colonization caused by Aspergillus flavus which is found responsible for producing aflatoxin in groundnut. The results found for percentage range of infection is, that out of fifty seven sample tested 23 sample (40.35%) are found completely nil and safe to eat, 21.05% have infected below 25%. The 14.03% samples are found infected in between above 25 to below 50 % range and 12.30% samples are found infected in between above 50 to below75 % range. The only one sample (1.75%) stood in between above 75 to 99 percent range of infection. For 100% range of infection six samples (10.52%) results are found. The results obtained for percentage range of colonization indicates that, out of fifty seven samples tested 25 samples (43.85%) are found completely healthy and safe to eat, and 14.06% samples have colonized below 25%. The 12 samples (21.05%) are found colonized in between above 25 to below 50 range. The five samples (8.77%) are found colonized each in between above 50 to below75 and above 75 to 99 percentage range. For 100% range of colonization only two samples (3.50 %) results are obtained

Key words: Mycotoxin, aflatoxin, groundnut, infection, colonization.

INTRODUCTION

Mycotoxins (mykos = of fungal origin; toxikoses = toxins) are toxic substances produced mostly as secondary metabolites produced by fungi that grow on seeds and feed in the field, or in storage. The occurrence of mycotoxins in agricultural commodities is a major health concern for livestock and humans. Aflatoxins are the secondary metabolites of the fungi namely, *Aspergillus flavus* and *A. parasiticus.* Aflatoxins are further differentiated into sub types such as B1, B2, G1, G2 because of their blue (B) and green (G) fluorescence under ultraviolet light respectively, based on structure, chromatographic and fluorescent characteristics. These fungi can infect the crop in the field, or the produce during the processing, handling, storage. The fungus produced olive green colored colonies with abundant sporulation, the accumulation of the aflatoxins occurs in the kernels or feed. Both raw and processed fruits and vegetables are highly susceptible to mycotoxin contamination (Giryn and Szteke 1995). *A. flavus* is often countered as a tomato fruit rot pathogen during postharvest survey (Samyal and Sumbali 2002).Aflatoxins are potent carcinogenic substance and have also been implicated in human diseases like hepatitis B, tuberculosis by suppressing immune system. Spores of *A. flavus* are saprophytic in nature and once they become pathogenic, they are known to produce an array of toxic secondary metabolites including aflatoxins (Nallathambi and Umamaheswari 2009). Aflatoxins are known to be highly carcinogenic and have been classified as group I carcinogens by International Agency for Research on Cancer (IARC 1993). In our earlier surveyed carried out for awareness and assessment for aflatoxin of Muktainagar Taluka in Jalgaon district of Maharashtra it has been observed that only 36% individual were found aware about the aflatoxin and 64% were unaware about it and for other toxin 48% were aware and 52% were unaware (Yeole and Deshmukh 2013a). The survey carried out for Malkapur Taluka in Buldhana district of Maharashtra the data collected on awareness about aflatoxin which indicates that 60% individuals were aware about the aflatoxin and 40% were found unaware about it. 62% consumers were aware about the toxin, other than aflatoxin and 38% were unaware about this (Yeole and Deshmukh 2013b). The survey carried out for awareness and assessment of Pune district of Maharashtra indicates that 14% were aware and 86% individuals were found unware about the aflatoxin and for toxin other than aflatoxin 32% were aware and 68% individuals were found unware (Yeole *et al*. 2014). In our previous study examined for in vitro evaluation for *Aspergillus flavus* producing aflatoxin in groundnut the unsafe limit was found 14% minimum to 50% maximum but, highest was found 65% (Yeole *et al.,* 2016). Thus, aflatoxins have become of concern in agriculture as well as in animal and human health on a global scale.

Three basic approaches viz, prevention, removal and detoxification seem to be promising for aflatoxins control. Use of crop rotation and intercropping found useful in preventing aflatoxins contamination (Desai and Ghewande, 1999). Addition of calcium and gypsum also reduce pre-harvest aflatoxin contamination (Davidson *et al*, 1983). Use of resistance genotype like Chitra (Desai, 1990), PI-337409 (Pettit *et al*., 1986) and other bold seeded genotype like ICG-239, B-95, B-99-1 supported to lowest aflatoxin production (Ghewande *et al.*, 1993) are useful in resistance breeding programme. Simple methods like exposure of oil to bright sunlight, use of common salt (10%) are useful even at household level for detoxification of aflatoxin (Shantha, 1987). The different factors responsible for aflatoxin contamination at different level are catagories as pre –harvest level, at plant level, harvesting level and on at storage level i.e. post harvest level.

MATERIALS AND METHODS

To determine the growth of *Aspergillus flavus* in groundnut, summer produced hundred samples collected from villages of Muktainagar and Malkapur taluka of Jalgaon and Buldana district respectively. Out of these hundred samples collected only fifty seven samples from consumers were processed, after surface sterilization and were incubated on Czapek-Dox (pH-7.3) Rose Bengal Agar medium (Aneja, 2003) in two replicate having five groundnut seeds in each petri dish and examined for their growth of percentage infection and colonization caused by *Aspergillus flavus* producing aflatoxin in groundnut.

RESULTS AND DISCUSSION

The data given in the Table 1 indicates that total hundred groundnut kernels samples are collected from which three are from Naygaon, Taroda and

Muktainagar and four from Talaswada, Siradon, Tandulwadi and Malkapur. Out of hundred samples collected fourteen are from Naygaon, six each from Taroda and Muktainagar, forty from Talaswada, four from Siradon, ten from Malkapur and twenty are from Tandalwadi. All these hundred samples are categorized in three type producers, commercial and consumer depending upon their source of collection.

Table 1: Details of collected groundnut samples.

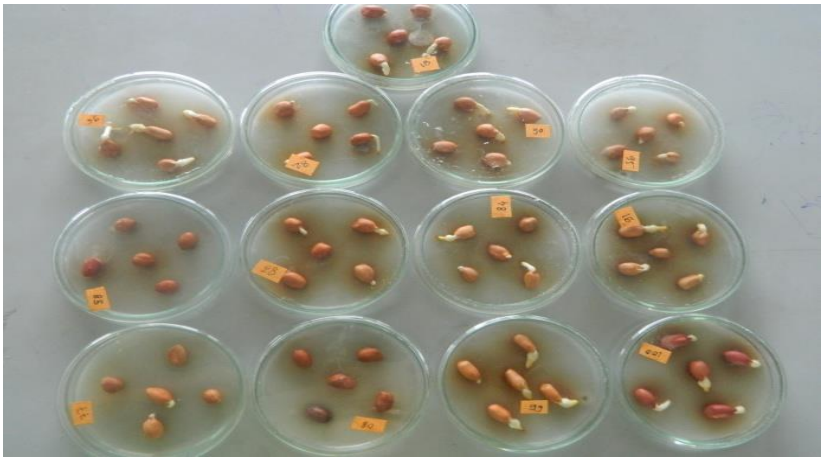
Name of Talukas	Name of Villages	No .of samples	Type of samples	No. of samples
Muktainagar	Muktainagar	06	Consumers	57
	Naygaon	14		
	Taroda	06		
Malkapur	Malkapur	10	Producers	40
	Talaswada	40		
	Sirodon	04	Commercials	03
	Tandulwadi	20		
Total samples		100		100

Table 2. Growth study of *Aspergillus flavus* in groundnut.

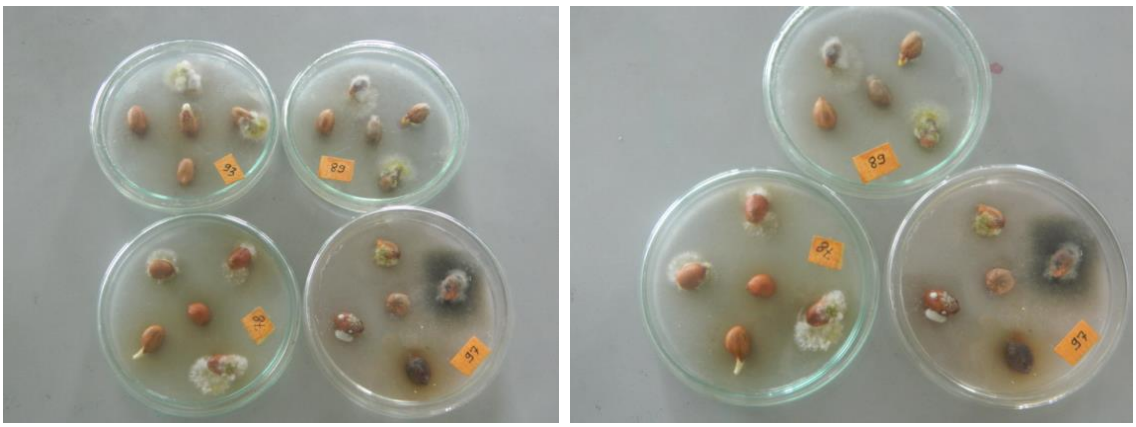
Sr. No.	Sample N0.	Infection %	Colonization %	Sr. No.	Sample No.	Infection %	Colonization %
1	9	20	40	30	53	20	40
2	16	00	20	31	54	20	20
3	17	20	80	32	55	40	00
4	18	20	80	33	56	00	00
5	19	00	00	34	57	40	40
6	20	40	80	35	58	100	40
7	21	00	00	36	59	60	80
8	22	00	00	37	60	00	00
9	23	00	00	38	71	100	60
10	24	00	80	39	73	60	60
11	25	00	00	40	74	20	100
12	26	40	20	41	75	100	100
13	27	20	40	42	76	00	00
14	28	100	40	43	77	00	00
15	29	00	00	44	78	60	00
16	30	60	60	45	79	00	00
17	31	20	20	46	80	20	00
18	32	40	20	47	84	00	00
19	33	60	20	48	85	00	00
20	37	80	00	49	86	20	40
21	38	60	60	50	88	00	00
22	39	00	40	51	89	20	40
23	43	40	20	52	90	00	00
24	44	100	40	53	92	40	40
25	45	00	00	54	93	40	40
26	48	20	00	55	94	00	00
27	49	100	60	56	95	00	00
28	50	60	20	57	98	00	00
29	51	00	00	---	---	---	---

The fifty seven samples are found from consumer, forty from producer and only three from commercial.

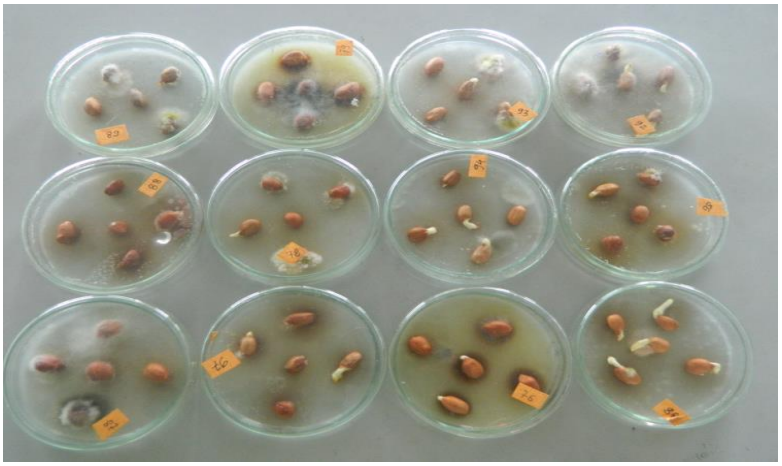
The data in the Table 2 shows about fifty seven samples collected from consumers were tested for growth study of *Aspergillus flavus* in groundnut. All fifty seven samples were first surface sterilized with sodium hypochlorite and then incubated on Czapek-Dox Rose Bengal Agar medium (pH-7.3) in two replicate having five seeds in each petri dish. The observation was noted down for its infection and colonization after three to five days.



NON INFECTED SEEDS



INFECTED SEEDS



INFECTED SEEDS

Table 3: Tested sample shown for infection and colonization by *Aspergillus flavus* in groundnut.

Sr. No.	Percentage range	Infection (No. of sample)	Percentage of infected samples	Colonization (No. of samples)	Percentage of colonized samples
1	00 (Nil)	23	40.35	25	43.85
2	<25	12	21.05	08	14.06
3	>25 to <50	08	14.03	12	21.05
4	>50 to <75	07	12.30	05	8.77
5	>75 to 99	01	1.75	05	8.77
6	100	06	10.52	02	3.50
Total		57	100	57	100

The data in the table 3 shows the percentage range of tested sample for infection and colonization by *Aspergillus flavus* in groundnut. All the tested sample are categorized in six different range of percentage for infection and colonization. The results found for percentage range of infection is very interesting, that out of fifty seven sample tested 23 sample (40.35%) are found completely nil and safe to eat, 12 samples (21.05%) have infected below 25%.The eight samples (14.03%) are found infected in between above 25 to below 50 range. The seven samples (12.30%) are found infected in between above 50 to below75 range. The only one sample i.e. (1.75%) stood in between above 75 to 99 percent range of infection. For 100% range of infection six samples i.e.10.52% results are obtained.

CONCLUSION

The final conclusion found in this aflatoxin survey on groundnut samples collected from different places is indicates that if we compare both the result for number of sample and percentage range of infection and colonization, it is found clearly that, only 40 to 44% samples are found safe to eat and 4 to 11% are found 100% infected and colonized which are found completely unsafe to eat. The remaining 55 to 45 % samples stood in between 25 to 99 percentage range of infection and colonization which might be a prone for producing aflatoxin in groundnut.

Acknowledgement:
The author is very much thankful to Department of Biotechnology, Smt .G.G.Khadse College, Muktainagar, for getting permission and carrying out this research work successfully.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Aneja K (2003). Experiments in Microbiology and Plant Pathology and Biotechnoloy. 4th Edition. Pub.by New Age International (P) Ltd. New Delhi.

Davidson J, Cole R and Sanders T (1993). In Proceeding of the American Pea nut research and Education society, 17:71.

Desai S and Ghewande M (1999) Annual Report of NRCG, Junagadh. pp.85.

Desai S, Ghewande M, Nagraj G and Premnarayan (1990). Mycotoxin Research, 7:79-84.

Ghewande M, Nagraj G and Desai S (1993). Seed *Science and Technology*, 21:45 -51.

Giryn H and Szteke (1995). Estimation of *Alternaria* mycotoxins in some raw or processed fruit and vegetables, Roczniki Panst Zakl Higie, 46:129-133.

IARC (1993). Some naturally occurring substance: Food items and constituents, heterocyclic aromatic amines and mycotoxins, Monograph 56, International Agency for Research on Cancer, France.

Nallathambi P and Umamaheshwari C (2009). Detection of Aflatoxins in Pomegranate arils infected by *Aspergillus species. Ind Phytopath,* 62: 178-182.

Pettit R, Azauzeh R and Smith O (1987). In *Proceeding of International Workshop*, 6-9 October, ICRISAT, India (A P), pp. 153.

Samyal S and Sumbali G (2002). Post-harvest mycopathogenic loss of tomato fruits in Jammu. *J Ind Bot Soc.*, 81:105-108.

Shantha T (1987). In *Proceeding of International Workshop*, 6-9 October, ICRISAT, India (A P), pp. 291.

Yeole R and Deshmukh S (2013a). In Pelagia Research Library, Advances in Applied Science Research, 4 (3):74-79.

Yeole R and Deshmukh S (2013b). In Pelagia Research Library, Advances in Applied Science Research, 4 (4):381-386.

Yeole R, Deshmukh S and Wakode A (2016). In Proceeding International Conference on Plant Research and Resource Management and 25th APSI Silver Jubilee Scientist Meet, pp.58-63.

Yeole R, Mali B and Deshmukh S (2014). In Pelagia Research Library, Advances in Applied Science Research, 5(2):18-24.