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Survey on aflatoxin awareness and assessment of Malkapur Taluka in Buldana district of Maharashtra (India)

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ABSTRACT

The survey on Aflatoxin Awareness And Assessment of Malkapur Taluka in Buldana District Maharashtra (India), was carried out during the year 2012-13 to create awareness among the people and assessment of it through questionnaire method. A questionnaire of fifteen different questions was prepared. In this survey study, data was collected from twelve different villages of Malkapur taluka. Total fifty questionnaires sheet were sorted village wise and pulled data information about aflatoxin awareness and assessment is done. Among the twelve villages 23 questionnaires were collected from Malkapur, 8 from Nimkhed , 4 from Narvel and Talaswada each,3 from Datala,2 from Zodaga. One questionnaire each from these six villages (Bhangura, Lonwadi, Tandulwadi, Vadaji, Vivara and Anurabad) was collected. Out of 50 individuals surveyed 4 were S.S.C.14 were H.S.C.,28 and 4 were found graduate and post graduate respectively. The individuals who have obtained other qualification were found none. In the occupation status it has been observed that14% were engaged in service, in business it was 4%, in agriculture it was16% and the people involved in other business were found 66%. In consumption of oil it was found that 64% family utilized less than 5 Kg. or 5 Kg. of oil and 36% family consumed more than 5 Kg. of oil per month.80% families are found which have 5 or less than 5 members and 20% families have more than 5 members in the family. The average consumption of oil per individual is found in between 1 to 1.5 Kg. per month. The soyabean oil is consumed by 88% and groundnut by12% only, none of the families was found using cotton or other type of oil. In adulteration of oil 80% individuals were aware and 20% were unaware about it. It is observed that 82% individuals purchased branded company oil,16% utilized local brand oil whereas 2% found using loose oil .For the reason behind using branded oil, 82% individuals replied that it is always pure and good for health while18% persons have replied for different reasons behind using branded oil .The reason behind purchasing local company oil 16% have answered, for getting it cheaper and easily available compared to that of the branded one, and 84% have replied that there are other reasons besides this to purchase local company oil. The other common reasons were found are saving money, scarcity of money, economically reasonable and poor purchasing capacity of the individuals. The information collected on the physical fitness of the people, indicates that all individuals (i .e. 100%) were found physically sound. Data collected on different types of storing appliances for groundnut indicates that among 50 individuals surveyed 6% used plastic gunny bags, 4% used plastic container, 88% used aluminium tin to store groundnut pods and only 2% used to keep it open. The data collected on awareness about aflatoxin 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. The maximum effort was done to made all these surveyed individuals aware about the aflatoxin and the reasons behind producing it.

Key words: *Aspergillus flavus*, aflatoxins, groundnut, mycotoxins, survey

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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 term 'mycotoxin' is usually reserved for the toxic chemical products produced by fungi that readily colonize crops[1]. One mold species may produce many different mycotoxins, and the same mycotoxin may be produced by several species [2]. The symptoms of a mycotoxicosis depend on the type of mycotoxin; the concentration and length of exposure; as well as

age, health, and sex of the exposed individual [3]. Aflatoxins are a type of mycotoxin produced by *Aspergillus* species of fungi, such as *A.flavus* and *A.parasiticus* [4a]. The umbrella term aflatoxin refers to four different types of mycotoxins produced, which are B_1, B_2, G_1, and G_2[5a]. Aflatoxin B_1, the most toxic, is a potent carcinogen and has been directly correlated to adverse health effects, such as liver cancer, in many animal species [4b]. Aflatoxins are largely associated with commodities produced in the trop[ic and subtropic, such as cotton, peanut, spices and maize[4c,5b].

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 subtypes 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. On the infected pods, kernels or in the culture, the fungus produced olive green coloured 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 [6]. *A. flavus* is often countered as a tomato fruit rot pathogen during post harvest survey[7]. 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[8]. Aflatoxins are known to be highly carcinogenic and have been classified as group I carcinogens by International Agency for Research on Cancer [9]. In our earlier surveyed carried out for awareness and assessment for aflatoxin 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[10]. 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 [11].Addition of calcium and gypsum also reduce pre-harvest aflatoxin contamination [12].Use of resistance genotype like Chitra [13],PI-337409[14] and other bold seeded genotype like ICG-239, B-95, B-99-1 supported to lowest aflatoxin production [15] 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[16].

The different factors responsible for aflatoxin contamination at different level are catagories as pre –harvest level i.e.at soil level -native population of *A. flavus* group of fungi varies from farm to farm depending on soil types and crop rotations. At plant level-drought prone sandy soil in which groundnut is grown year after year are hot spots for aflatoxin contamination. Prolonged drought 3-4 week during seed formation and maturation stages triggers aflatoxin contamination.

Harvesting level-Mechanical damage to the pods at the time of harvesting, threshing or damaging testa during the process of decortications. Harvesting f crop immediately after irrigation and consequent high initial pod moisture at the time of processing and storage promote condition for aflatoxin build up in the produce. Inefficient and slow drying process under the humid condition enhances aflatoxin contamination risk greatly. Post harvest level (storage level) –storage of produce in warm and humid room with a large stack directly on the floor favours rapid multiplication of the fungus and affects even good lots.

MATERIALS AND METHODS

To conduct survey on aflatoxin awareness and assessment a questionnaire of fifteen different questions was prepared. The questions were related with their qualification, occupation, number of members in the family, whether they have previous knowledge of aflatoxin contamination in groundnut and other related toxins produced due to adulteration in consumable food items. Quantitiwise and qualitywise monthly utilization of edible oil by the family. Reason behind the utilization of branded and local product of edible oil, physical fitness, use of different means like gunny bag , plastic container, aluminium tin or the open space for storing groundnut .

This survey of Malkapur taluka was carried out during the year 2012-13 and data was collected personally from the individuals. The main concept behind this survey was to compare difference in the information collected from our previous survey carried out for Muktainagar taluka and to create more awareness among the individuals of

Malkapur taluka about aflatoxin and other food related toxin. Here, in this survey study, data was collected from different villages of Malkapur taluka in Buldana district of Maharashtra. The total twelve different villages were covered in this survey, details of which are given in the table. All these fifty questionnaires were sorted village wise and data information about aflatoxin awareness and assessment is done.

RESULTS AND DISCUSSION

The data in the Table 1 indicates, village wise distribution of 50 questionnaires collected, total twelve villages were covered to collect data. Among the twelve villages 23 questionnaires were collected from Malkapur,8 from Nimkhed, 4 from each Narvel and Talaswada,03 from Datala,02 from Sodaga and 01 from each Bhangura, Lonwadi,Tandalwadi, Badaji, Vivara and Anurabad villages.

Table1.Number of questionnaires collected from different villages of Malkapur Taluka in Buldana district.

Sr. No.	Village Name	No. of questionnaires	Sr. No.	Village Name	No. of questionnaires
1	Malkapur Taluka	23	7	Bhangura	01
2	Nimkhed	08	8	Lonwadi	01
3	Narwel	04	9	Tandalwadi	01
4	Talaswada	04	10	Badaji	01
5	Datala	03	11	Vivara	01
6	Zodaga	02	12	Anurabad	01

The data in the Table 2 illustrate about two parameter educational qualification and occupation of the individuals surveyed. The parameter educational qualification was added in the questionnaires to know about the civilized status of the people and it has been observed that among the 50 people answered 4 individual (i.e.8%) were S.S.C., 14 individual (28%) were H.S.C.,28 individual (56%) and 4 individual (8%) were found graduate and post graduate respectively. In the occupation status it has been observed that out of 50, 7 i. e. 14% were engaged in service, in business it was 2 (4%), in agriculture it was 8 i.e.16% and the individuals involved in other business were found 33 i.e.66%.

Table 2. Parameter wise data collected from 50 questionnaires

Sr. No.	Educational Qualification	No. of Individual	Percentage over total	Sr. No.	Occupation	No. of Individual	Percentage over total
1	S.S.C.	04	08	1	Service	07	14
2	H.S.C.	14	28	2	Business	02	04
3	Graduate	28	56	3	Agriculturist	08	16
4	Post Graduate	04	08	4	Other	33	66

The result obtained for other parameters like family members, rate of oil consumption per month, type of oil, adulteration in oil, purchase of oil, reason behind using branded and local company oil, physical fitness, storing facility for groundnut, and awareness of the people about aflatoxin and other toxin in groundnut is depicted in the Table 3.

To determine the rate of oil consumption per family per month, the rate of oil consumption was categories in two i.e. in type first family consuming 5Kg.or less than 5 Kg. of oil was included and in type second family consuming more than 5 Kg. of oil was incorporated. The results in the Table 3 shows that among the 50 individuals 32 (i.e. 64%) family consumed less than 5 Kg. or 5 Kg. of oil per month and 18 (i.e.36%) family consumed more than 5 Kg. of oil per month. If we have compared the data on the rate of oil consumption per month with that of family members, this indicates 80% families are there which have 5 or less than 5 members in the family and 20% families have more than 5 members in the family. The detailed consumption of oil per individual per month is found in between 1 to 1.5 Kg. per month. The information was collected on type of oil consumed by the consumer and it has been observed that soybean oil is consumed maximally by 44 families i.e. 88% and groundnut by 6 i.e.12% families and no one was found consuming cotton or other type of oil.

Now a days some agencies knowingly or unknowingly sometime are doing adulteration in oil to profit more money without considering about the health of the consumer. So, to make consumer more alert about adulteration they were questioned whether they are aware about this or not the answer was collected in yes or no form. Data in

table 3 indicates that out of 50 individuals 40 i.e. 80% were aware and remaining 10 i.e.20% individual were unaware about this. They were made aware and insisted them to purchase good quality oil for better health. To know the purchasing level of the individual the data was collected in three categories i.e. branded, local and in loose type of oil purchased by the consumers. It has been observed that 82% families purchased branded company oil, 16% utilized local brand oil whereas 2% found using loose type of oil.

Table 3.Parameter wise data collected from 50 questionnaires

1	Family Members	5 or less than 5	40 (80%)
		Greater than 5	10 (20%)
2	Rate of Oil Consumption per month	5 or less than 5 Kg.	32 (64%)
		Greater than 5 Kg.	18 (36%)
3	Type of Oil Consumed	Groundnut	6 (12%)
		Soybean	44 (88%)
		Cotton	00 (00%)
		Other	00 (00%)
4	Adulteration in Oil	Yes	40 (80%)
		No	10 (20%)
5	Purchase of Oil	Branded company	41 (82%)
		Local company	08 (16%)
		Loose	01 (02%)
6	Reason behind using branded company oil	Pure	41 (82%)
		Other	09 (18%)
7	Reason behind using local company oil	Cheaper/easily available	08 (16%)
		Other	42 (84%)
8	Physical Fitness	Yes	00 (00%)
		No	50 (100%)
9	Storing Facility	Plastic gunny bag	03 (06%)
		Plastic container	02 (04%)
		Aluminium tin	44 (88%)
		Open space	01 (02%)
10	Awareness about Aflatoxin	Yes	30 (60%)
		No	20 (40%)
11	Awareness about other toxin	Yes	31 (62%)
		No	19 (38%)

Those who were using branded oil for culinary purpose an effort was made to find out the reason behind using branded oil, it has been found that out of 50 individuals 41 i.e.82% individuals used it because it is pure and good for the health while remaining 9 individuals (18%) have replied for different reasons behind using branded oil.

In the reason behind purchasing local company oil 8 individuals (i.e.16%) have answered for getting it cheaper and easily available compared to that of the branded one, the remaining 42 (i.e.84%) have replied that there are other reasons besides these to purchase local company oil. The common reasons for purchasing local company oil over the branded were saving of money, scarcity of money, economically reasonable, and poor purchasing capacity of the consumers.

The information was collected about the physical fitness of the people, the main idea behind this was to know about what are the common physical problems among them, and could we find out any relation with their life style. It has been observed all 50 individual were found physically sound and no one was suffering from any physical problems.
For storing groundnut while using for domestic purpose data was collected on different types of storing appliances or alternatives used by the local village people. It has been observed that among 50 people 3 (i.e.6%) used plastic gunny bags, 2 (4%) used plastic container, 44(88%) used aluminium tin to store groundnut pods and remaining 2% individuals used to keep open temporarily before consumption.

To know the awareness among the people about aflatoxin which was the main concept of this survey from the data collected it is found that out of 50 individual only 30 i.e.60% were aware about the aflatoxin and 20 i.e.40% were unaware about it. These unaware 40% individuals were made aware about aflatoxin during collecting information from them.

Besides aflatoxin an effort was made to know if consumer is aware about the toxin (other than aflatoxin) which may cause due to any other reason and the findings for this is found that out of 50 individuals 31 (62%) replied yes and remaining 19 (38%) individuals were unaware about this.

So, to keep groundnut free from aflatoxin dry well, filled healthy pods and bring down pod moisture below 10%.Use always new and clean gunny bags or aluminium tin to store the groundnut. Produce must be stored in a well-ventilated leak proof room. Store bags on wooden pallet, keep one meter distance from walls and between stacks. Do not keep immature and damaged pods along with healthy pods. Do not dry diseased or pest infected pods along with healthy pods. During store the produce moisture should not exceed 10% .Try to avoid old and damaged bags for storing , which may be infested with pests. Try to avoid keeping bags directly on the floor. Remove shriveled, discolored and damaged kernels from the lot including the nuts with broken testa by hand picking and then put them in new gunny bags. By adopting and applying these tips, it has been possible to obtained aflatoxin risk free groundnut.

CONCLUSION

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 potent carcinogenic substance and have also been implicated in human diseases like hepatitis B, tuberculosis by suppressing immune system. Among all the parameter studied in the survey on aflatoxin awareness and assessment, from the data analyzed, it is concluded that the parameters like educational qualifications, occupation, family members and physical fitness are of least importance but the parameters which are related with direct consumption of oil for domestic purpose are of more importance. It is to be taken very seriously and there is an urgent need to aware the society people regarding adulteration in oil, insisted them to purchase good quality or branded company oil. It is necessary to consume oil in appropriate quantity, to much or over use i.e. beyond limit may cause health problems in future. All types of food materials stored for consumption must be well dried and stored properly.

Here in this aflatoxin survey it has been observed that 60 % individuals were aware and 40% were unaware about aflatoxin contamination in groundnut, so these 40% were made aware about aflatoxin and problems causing due to consumption of aflatoxin contaminated groundnut or oil. In our previous survey carried out for Muktainagar taluka it is found that the ratio of awareness and unawareness was exactly reverse i.e. 36% aware and 64% unaware this may be due to higher civilized status of the society people. So to make all such aflatoxin unaware individuals 100% aware about it's contamination in the food items, there is a need to conduct campaign for this through college level by students of life sciences, Food Corporation of India, Food and Drugs Research Institute, Health and Agricultural departments. Food and Drugs Research Institute, Health and Agricultural departments should keep a check on this by sudden sample collecting, from market yards, provisions store and agricultural produce and detecting the level of aflatoxin contamination through ELISA and TLC method.

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