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Impact of Mycotoxigenic Parasites &Biochemical Changes under Storage of various Containers on Quality of Wheat Grain and its Prevention: An Analysis

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Abstract - The present study has been designed to study the effect of microorganisms on the nutritional value of wheat grain and flour, stored in different types of scientific storage conditions entitled as "Impact of Mycotoxigenic Parasites &biochemical changes using of various storage containers on quality of wheat grain and its prevention" carried out in the Department. Of Plant Pathology, C.C.R. P.G. College, Muzaffarnagar. Three varieties of wheat grain and flour will be selected and stored in different containers to study the impact of storage on quality of wheat grain and flour as under: Varieties took: UP2338, PWB343, HD2329.Therefore, adequate conditions of storage of wheat and wheat flour can generate a considerable improvement in the national economy by controlling losses both in terms of quantity and quality. Information on biochemical changes in wheat and wheat flour due to storage in different household containers and their effect on products is scarce or obsolete. Consider the facts, and this study is designed to study different containers together with quality parameters.

KEYWORD: Mycotoxigenic Parasites, Biochemical Changes, Wheat Grain, Prevention.

I. INTRODUCTION

Food security and trustworthiness are critical and are among the driving elements for the sheltered conservation of grain. Bacterial contamination of the stored grains can be a significant thought for clients where the grain will not experience further treatments that incorporate a microbiocidal entry. Howbeit, issues brought about by form and Mycotoxins are all the more, for the most part, connected with the storage of wheat. With more prominent information on the origins of Mycotoxins, we currently comprehend that probably a few Mycotoxins in certain items are framed before collect or following harvest. Mycotoxins can shape during storage, yet just if there is sufficient moisture. Mushroom development, for the most part, creates an intricate progression of animal varieties, beginning with dry spell safe species (xerophilous). The metabolic action of these pioneer species builds the moisture substance of the grain, which can permit the development of mycotoxigenic species and, eventually, the arrangement of Mycotoxins.

At last, most stored grains are bound to wind up human or creature food. Food safety and quality are definitive components for long haul grain storage. In the field of food safety, bacterial pathogens and 'Mycotoxins' ought to be considered. They are frequently utilized in the determinations set by national and universal Australian grain purchasers. Quality issues incorporate decay because of shape development, creepy crawly and bug invasion, and general cleanliness issues, for example, insurance against rodents and flying creatures.

Impact of Bacterial Contamination

The bacterial species that usually show up in wheat is commonly not pathogenic, albeit contamination with bacterial pathogens, for example, *Salmonella*, *Escherichia coli*, and *Bacillus cereus*, may happen. *Salmonella* and *E. coli* are enteric microbes, and their quality in wheat is usually a sign that winged animals or rodents have defiled it. This can happen during the collect, yet more regularly; it is the after effect of poor cleanliness of trucks out and about or rail during transport or poor nuisance control during storage. The degrees of contamination with enteric pathogens are commonly shallow.

Most oats for human consumption are ground without precedent for flour or other wheat-based items, for example, semolina, wheat germ, and grain. The pounding procedure can add to the microbiological load of the flour, howbeit, the flour is by and large exposed to further processing, for example, heating, which will execute generally microscopic organisms. The molding of the grain to build the moisture substance to a level appropriate for pounding can likewise expand the number of microscopic organisms, yeasts, and molds (Berghofer et al. 2003). Microbial contaminants are amassed in the external layers of the grain (wheat and wheat germ). These are expelled during crushing, leaving the last item, the flour, moderately spotless and by and mostly free of pathogens. Enteric pathogens, for example, *Salmonella*, are once in a while segregated from direct-run flour, although *Bacillus cereus* might be available in low numbers.

Mycotoxin Contamination before Storage

The nearness of Mycotoxins in wheat was generally viewed as a marker of poor storage conditions. The culmination of this was mildew covered wheat contained Mycotoxins. None of the announcements is fundamentally valid. Mycotoxins can be created because of poor conservation, yet they may, as of now, be available in stored grain. In actuality, not all shape that develops in stored items produces Mycotoxins.

A portion of the growths related to wheat in the field (regularly alluded to as "field mushrooms") can shape Mycotoxins, preceding or the following harvest. *Alternaria*, *Fusarium*, *Aspergillus* and *Penicillium* can go about as wheat pathogens previously or after harvest and can frame "Mycotoxins". *Alternaria* and *Fusarium* do not contend firmly in decreased sea-going exercises, so it is impossible that they will shape "Mycotoxins" once the grain is dry or during storage. Interestingly, *Aspergillus* and *Penicillium* are regularly considered "conservation mushrooms." They are known to frame "Mycotoxins" in stored grains and are commonly not considered organisms that can deliver "Mycotoxins" before harvest.

"Mycotoxins" Formed by *Fusarium*

Numerous *Fusarium* species can shape "Mycotoxins" in oats. "However, there are two species (and those firmly identified with them) that are accepted to have a more prominent potential to cause grain contamination by Mycotoxins: *F. graminearum* and *F verticillioides* (in the past known as F. moniliform). *F. graminearum* and the firmly related *F. culmorum* species cause outside layers on the head or ruin of the head in wheat, rye and triticale, and corn and panicle spoil (Burgess et al. 1994). Different yields of little grains, for example, grain and oats might be influenced. *F. graminearum* is increasingly typical in wheat in hotter atmospheres, for example, Australia, North America, and China, while *F. culmorum* is the common species in colder developing regions, for example, Finland, France, Poland and the Netherlands (Miller et al. 2001). The most significant mycotoxin framed by these *Fusarium* species is the tricothecene poison, deoxynivalenol, otherwise called DON or vomitoxin (Miller et al. 2001).

F. verticillioides (*F. moniliforme*) is generally appropriated all through the world and gives off an impression of being built up in maize any place it is developed. It causes decay of the stem and corn cob, yet additionally spoil of the basal stem and decay of the sorghum root, decay of the foot of rice, and spoil of the crown of asparagus. *F. verticillioides* and firmly related species, for example, *F. proliferatum*, structure fumonisins in maize and sorghum (Burgess et al. 1994). Equine species are extraordinarily delicate to this mycotoxin, which causes leukoencephalomalacia, otherwise called mildew covered corn ailment or visually impaired visual impairment (Marasas et al. 2001).

Pre-Storage Contamination with Aflatoxins

A few oilseeds and seeds might be sullied with aflatoxins previously or the following harvest. Peanuts are especially defenseless to aflatoxin contamination before harvest, and broad research has been directed on this issue in Australia. Shelled nut plants can be colonized during the development cycle by *Aspergillusflavus* or *Aspergillusparasiticus* strains, which are fit for creating aflatoxins (Pitt et al. 1991). In blustery conditions, if shelled nut plants experience worry (for instance, dry season worry) close to the season of harvest, at that point aflatoxin can shape in the maturing peanuts. Aflatoxin levels may likewise increment the following harvesting during field drying, mainly if downpour draws out the drying time frame in the field.

Different items that can be colonized by *A. flavus* before harvest, with the ensuing development of aflatoxins, are maize, cottonseed and nuts like pistachios and Brazil nuts (Olsen 2003). Aflatoxins can influence numerous different items during storage, as *A. flavus* and related species develop well in decreased aw (up to about 0.80), and aflatoxins can be delivered up to about 0.85 aw (water activity) (Hocking and Pitt 2003).

Post-harvest contamination with ochratoxin: A ochratoxin (OA) was first confined from *Aspergillus* ochraceus in 1965, in a research facility concentrate on searching for new lethal metabolites of form. OA was found as a natural maize contaminant in 1969 in the United States. Nearly simultaneously, thinks about were being directed in Scandinavia on a renal sickness in pigs, which gave off an impression of being identified with rotten food. These investigations demonstrated that OA was the reason for the ailment, presently known as porcine nephropathy. From that point forward, OA has been found as a contaminant for grains in most European nations and North America.

Mould Growth and Quality Issues

The growth of mold in the grains can make hurtful changes also the arrangement of Mycotoxins. Many falling apart growths cause loss of germination in seed beans, staining and obscuring of the grains, decrease of protein content, smells of moisture, and changes in the profiles of fatty acids and other granule segments. Mold growth can likewise energize bug and bug invasion.

Mold growth during storage can be controlled or forestalled by guaranteeing that the grain is appropriately dried readily. Extra assurance can be given by staying away from the improvement of temperature and humidity slopes by cooling and circulating air through the grain. Insurance against bug invasion will likewise help counteract the growth of mold in stored oats, both in mass and in bags.

The contamination of the grain stored by bacterial pathogens is commonly not a significant issue, since pathogens, for example, *Salmonella endure* ineffectively in wheat. Besides, most oats bound for human consumption will experience processing stages that will decimate bacterial pathogens before the items achieve the purchaser. The contamination of wheat by "Mycotoxins" is not generally the consequence of poor conservation, as certain "Mycotoxins", specifically, *Fusarium* poisons, may as of now be in the grains when stored. Be that as it may, if the molds begin to develop in the stored grains, the Mycotoxins can shape if the fungal progression creates to a certain degree where mycotoxigenic species can develop, for the most part above about 0.83 aw. Notwithstanding whether Mycotoxins are an issue or not, any improvement of mold in the stored granules is unfortunate.

In this manner, it is inescapable that interspecific and intraspecific communications happen contingent upon the nutritional status of the grain and the prevailing ecological conditions. Grain quality misfortune was estimated, and models dependent on germination rates, apparent growth of mold or wheat breathing, and microorganisms were created. Infinitesimal growth can be a more successful proportion of beginning colonization than noticeable molding. A few endeavors have additionally been made to relate the losses of dry substance with the actual caloric losses because of the action of the mycotoxigenic molds.

II. OBJECTIVES

- To investigate biochemical changes in different storage containers for quality of wheat grain and flour and
- To study the Impact of Mycotoxigenic Parasites and its preventive methods.

III. MATERIALS AND METHODS

Selection of Materials

Three varieties of wheat grain and flour will be selected and stored in different containers to study the impact of storage on quality of wheat grain and flour as under: Varieties took: HD2329, PWB343, UP2338

Sample of grain of certified wheat varieties will be collected from market/ Govt. agencies such as IARI or any other relevant agency.

Method

The wheat was fumigated with phosphine and stored in four types of a 20 kg container under existing environmental conditions in a room for one year. Temperature / humidity records were maintained. The warehouses were ventilated with the door opening during the day. The containers were opened twice a week and the grains were stirred with a wooden rod to avoid the impact of localized temperature or humidity.

Four different containers were taken as follows:

- Earthen Pot

- Metallic or Tin Container
- Jute Bags
- Polyethylene or Polypropylene Bags

Procedure of Analysis

For an analysis, samples were drawn after every four months and analyzed for biochemical composition, dough rheology/farinograph, microbial investigation and baking quality/chapatti quality(AACC 2000).The Statistical analysis included ANOVA using a three-factorial factorial with a complete randomized block design applied. The media were compared by applying the Duncan multiple range test at P = 0.05 (Steel and Tome, 1980).

IV. ANALYSIS OF STORAGE EFFECT

Wheat grains of three varieties Namely HD2329. PWB343, and UP2338, harvested in consecutive years i.e. 2013-14 and 2014-15 were stored in four different (Earthen pots, Tin containers, Jute bags, Poly propylene bags) containers up to one year at ambient conditions. Results of various quality parameters analyzed are being discussed in the following Sections:

Storage Effects on Falling Number

The decreasing number is an indirect measure of ά-amylase activity (Ibanoglu, 2002). It is of considerable importance, since there is a direct relationship between the enzymatic activity and the attributes of the finished product (quality of the bread, volume of the bread, etc.). The reduced water retention capacity of degraded starch reduces the absorption of the flour during cooking and reduces the yield of the bread / the unit weight of the flour (Curic et al., 2002). FN is an indication of the degree of solidity of the grain in terms of absence of sprouting (Karaoglu et al., 2010) which causes the production and activation of the α-amylase inside the grain of wheat which in turn has a very drastic effect on the pasta and cooking process.

Storage Results for the duration of2013-14 and 2014-2015

The varieties differed significantly in FN during the one-year retention period; UP2338 had the highest number of falls, therefore PBW343, while PBW343 had the lowest number of falls. The interaction of VxC is shown in Table 1. The values for FN ranged from 237.85 seconds in PBW343 stored in earthen pots to 273.85 seconds in HD2329 stored in jute bags.

Table 1: Inter active effect of storage containers and varieties on falling number (sec) of wheat grains during 2013-14 (VxC)

Varieties/Containers	Earthen pot	Tin pot	Jute bag	Polypropylene bag	Means
HD2329	263.85	260.85	273.85	262.85	265.35
PBW343	237.85	250.85	270.85	252.85	253.1
UP2338	282.85	273.85	280.85	276.85	278.6
Means	261.52	261.85	275.18	264.18	265.68

The VxP interaction (Table 2) shows that the changes in FN were inconsistent. The lowest value (214 seconds) was observed in PBW343 at the beginning of the experiment which reached the highest value (282.5 seconds) in 8 months of storage (284 seconds). UP2338 had the highest value of all observed values, i.e. 295.55 seconds initially decreased after 4 months, increased the following 4 months and then decreased again at the end of the storage time. HD2329 also followed the same model.

Table 2: Interactive effect of storage periods and varieties on falling number (sec) of wheat grains during 2013-14 (VxP)

Variety/ Periods	0Month	4Month	8 Months	12 Months	Means
HD2329	283.87	251.66	274.59	269.09	269.8
PBW343	213.19	250.07	283.39	277.46	256.03
UP2338	295.55	257.45	282.5	273.16	277.17
Means	264.2	253.06	280.16	273.24	267.67

LSD (p ≤0.05) = 5.55

The results of the interaction between the containers and the shelf life (PxC) are shown in Table 3. The highest value (290 seconds) was observed in the grains stored in jute bags for 8 months, followed by the grains in the same containers after 12 months, while the lowest value (244.65) was observed in the grains of the pots of tin preserved for 4 months.

Table 3: Interactive effect of storage periods and containers on falling number (sec)of wheat grains during 2013-14 (PxC)

Periods /Containers	Earthen pot	Tin pot	Jute bag	Polypropylene bag	Means
0 Month	265.17	265.17	265.17	265.17	265.17
4 Months	256.79	244.65	265.25	254.15	255.21
8 Months	267.3	275.95	290.05	272.95	276.56
12 Months	260.58	265.85	283.25	269.05	269.68
Means	262.46	262.91	275.93	265.33	266.66

ANOVA for FN in 2013-14 is shown in table 4. It shows that the variety, shelf life and types of containers differed significantly (P <0.001). The interactive effects of VxP, VxC and PxC and VxPxC were very significant (P <0.001).

Table 4. Analysis Of Variance Of Falling Number 2013-14

K-Value	Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Value	Prob
1	Replication	2	1.82E +01	9.12 E+00	1.44E-01	<0.0001
2	Factor	2	1.38E +04	6.92 E+0	1.09E+	<0.000

	A			3	02	1
4	Factor B	3	1.85E+04	6.18E+03	9.77E+01	<0.0001
6	AB	6	4.74E+04	7.90E+03	1.25E+02	<0.0001
8	Factor C	4	7.15E+03	1.79E+03	2.83E+01	<0.0001
10	AC	8	8.23E+03	1.03E+03	1.63E+01	<0.0001
12	BC	12	7.57E+03	6.31E+02	9.98E+00	<0.0001
14	ABC	24	9.02E+03	3.76E+02	5.95E+00	<0.0001
15	Error	118	7.46E+03	6.32E+01		
	Total	179	1.19E+05			

As for the varieties, HD2329 had the highest value, while no other difference was observed in the other two varieties. The interactive effects of the variety and containers are shown in Table 5; which shows that HD2329 had the highest value (304.85 seconds) in polypropylene bags, while UP2338 had the lowest value (273.85 seconds) in tin bags.

Table 5: Inter active effect of storage containers and varieties on falling number (sec) of wheat grains during 2014-15 (VxC)

Varieties /Containers	Earthen pot	Tin pot	Jute bag	Polypropylene bag	Means

HD2329	280.85	286.85	289.85	304.85	290.6
PBW343	278.85	275.85	283.85	279.85	279.6
UP2338	285.85	273.85	289.85	278.85	282.1
Means	281.85	278.85	287.85	287.85	284.1

LSD (p ≤0.05)=11.72

Table 6 shows the interaction between variety and shelf life (VxP). In HD2329, the FN values decreased over time, while in PBW343 the FN increased in the first 4 months and therefore decreased in 8 and 12 months of shelf life. UP2338 had the highest value (314.85 seconds) in the initial memory duration.

Table 6: Interactive effect of storage periods and varieties on falling number (sec) of wheat grains during 2014-15 (VxP)

Variety/ Periods	0 Month	4 Month	8 Months	12 Months	Means
HD2329	302.85	279.85	275.85	287.85	286.6
PBW343	247.85	307.85	275.85	278.85	277.6
UP2338	314.85	250.85	284.85	275.85	281.6
Means	288.52	279.52	278.85	280.85	281.93

LSD (p ≤0.05=10.48

The results of the interactive effect of the variety and containers (VxC) are shown in Table 7, the FN value varied between 261 seconds in a Tin can after 4 months to 301 seconds in polypropylene bags after 12 months, a value of between these two values were observed 283 seconds in jute bags after 8 months.

Table 7: Interactive effect of storage periods and containers on falling number (sec)of wheat grains during 2014-15 (PxC)

Periods /Containers	Earthen pot	Tin pot	Jute bag	Polypropylene bag	Means
0 Month	285	285	285	285	285
4 Months	283	271	279	271	276
8 Months	270	283	288	279	280
12 Months	275	261	283	301	280
Means	278	275	284	284	280

LSD ($p \leq 0.05$)=13.65

The ANOVA for the 2014-15 results, as shown in the table 8, shows that the effects of the shelf life of varieties and containers were very significant (P <0.001). The interactive effects of VxP, VxC and PxC together with the higher order of interaction, i.e. VxPxC were very significant (P <0.001).

Table 8. Analysis Of Variance Of Falling Number 2014-15

K-Value	Source	Degrees of Freedom	Sum of Squares	Mean Square	F-Value	Prob
1	Replication	2	5.05E+02	2.52E+02	1.18E+00	0.3103
2	Factor A	2	2.84E+03	1.42E+03	6.64E+00	0.0018
4	Factor B	3	2.63E+03	8.78E+02	4.10E+00	0.0082

6	AB	6	6.17E+04	1.03E+04	4.81E+01	<0.0001
8	Factor C	4	5.25E+03	1.31E+03	6.13E+00	0.0002
10	AC	8	4.70E+03	5.88E+02	2.75E+00	0.0081
12	BC	12	1.19E+04	9.88E+02	4.62E+00	<0.0001
14	ABC	24	1.23E+04	5.14E+02	2.40E+00	0.0010
15	Error	118	2.52E+04	2.14E+02		
	Total	179	1.27E+05			

All factors, i.e. varieties, shelf life and type of containers showed very significant variations in the two years under consideration. The effect of the containers was the same in both years, being the highest in polypropylene and jute bags in 2014-15, while also in tin pot in the 2013-14 periods.

Storage Effects on Fat Acidity

The Fatty acidity is important for cooking the quality of the flour. For a longer storage time, the properties of the flour change due to the effect of unsaturated fatty acids which can reduce the swelling of gluten and the absorption of water and increase the resistance of the starch against gelatinization, i.e. the high FN (Chen and Schofield, 1996).

Storage Results for the duration of2013-14 and 2014-2015

The increase in fatty acidity was substantial, i.e. it doubled more or less during the first four months of storage. This shelf life was characterized by high temperatures and critical humidity for lipase activity. The increase in fatty acidity during the rest of the shelf life (08-12 months) was low compared to the 4 month storage time, mainly attributed to the drop in temperature during this storage period; however, it may also be the result of a reduced availability of glycerides by hydrolysis.

HD2329 achieved the highest fatty acidity (41.17 mg / 100 g), while the lowest fatty acidity was found in the PBW343. Shelf life has significantly increased the acidity of fats over time. Table 4.57 represents the interaction between varieties and containers. The results show that the largest increase in fatty acidity was observed in the tin (37.54 percent) followed by 41.17 percent in the UP2338 earthen pot. The lowest value of 35.39 percent was observed in PBW343 stored in tin pot.

Shelf life has been observed to increase the acidity of fats in all varieties. The highest 54 percent value was observed in UP2338 after 12 months of storage, while the lowest increase was observed in PBW343.

The acid values of the fats in different containers and the shelf life varied from 20.62 percent in all containers at the beginning of the experiment to 53.8 percent in earthen pots after 12 months. While the grain in a tin box after 12 months and in a tin box after 8 months of storage had the second highest value, i.e. 50.10 percent.

Fatty acidity has increased in all varieties as conservation progresses. The observed interval was 52.3 percent in UP2338 after 12 months to 39.48 percent in PBW343 after 4 months. The fatty acidity of 50.01 percent in HD2329 after 12 months dropped between these two values.

Wheat grains stored during 2014-15 show that the interaction between variety, shelf life and content was also very significant. In HD2329 and PBW343 the greatest increase in fatty acidity was found in earthen pots after 12 months and in UP2338 the highest fatty acidity values were observed in the four containers, with the exception of jute bags. The lowest values were deposited in a tin pot and a earthen pot after 4 months of storage.

Storage Effects on Water Absorption Capacity

Water absorption is the quantity of water necessary to obtain optimal consistency dough suitable for baked products. Flour with higher water absorption is considered strong. The chapatti made with this type of flour are soft, flexible and maintain their characteristics for longer. More chapattis can also be produced from a certain quantity of flour with a greater absorption of water than that of a lower value.

Storage Effects on Dough Stability

The stability of the Farinograph mixture is the measure of the resistance of the mixture and shows the functionality of the final product. The grain with greater stability is used for the loaf of bread and for the heart and noodles.

Storage Results for the duration of2013-14 and 2014-2015

The maximum stability value of the dough was observed for the flours obtained from cereals stored in jute bags, followed by that of the polypropylene bags. Storing wheat in other containers reproduced the same stability as the dough. Shelf life significantly ($P < 0.001$) improved the stability of the mass of the stored grain.

Storage Effects on Farinograph Quality Number

The quality number of the farinograph provides an overview of the characteristics measured by the graph recorded during the mass development processes in the Brabender farinograph. Wheat with a higher FQN is strong, requires a longer mixing time, shows greater water absorption and stability, weak flour shows a low FQN, tends to develop rapidly, decomposes rapidly and shows a low index of mixing tolerance.

Total Plate Count

The most common microbiological indicators in wheat and wheat flour are the total plate count (also called total aerobic count), which refers to the total count of colonies of microbes growing on plates of coli or enteric bacteria-shaped media.

Storage Results for the duration of2013-14 and 2014-2015

The result shows that microbial growth in grains stored in different containers was different. The highest number of bacteria was observed in the tin can, the jute bags and polypropylene bags were similar in bacterial load, i.e. (2.2x105cfu / g). The earthen pot was better to have the lowest microbial load (1.7x105cfu / g). The shelf life had a significant effect on microbial growth, as shown. The interaction between VxC, it was observed that earthen pots were better for storing wheat varieties because they had a low total number of plates, while the highest count was observed in UP2338 stored in tin pots.

V. CONCLUSION

The impact of mycotoxigenic parasites on wheat grains stored after harvest ought to be inspected with regards to biology as a whole to comprehend the predominance of certain types of organisms under certain ecological conditions. The connections between these parasites and different contaminations are complex altogether impacted by the overarching and changing natural elements. By taking everything into account, the Mycoflora of stored wheat grains is comprised of universal - *Aspergillus*, *Alternaria*, *Cladosporium*, *Fusarium*, *Muco*, *Rhizopus*, and *Penicillium* genera. The most continuous species saw in the stored wheat grains of *Aspergillus* were A. niger, A. fumigatus, *Alternaria* alternata, *Fusarium* moniliformis, *Rhizopus* arrhizus and some *Penicillium* species and a portion of the parasites can create 'Mycotoxins' which can debase and cause weakening in cooking and granulating quality. Grain losses in amount and quality can be as fatigue as referenced above, for example, essentialness, hardness, shading, size, and state of the seed, weight of the grain, and different biochemical parameters, proteins, carbohydrates, and vitamins in stored and post-harvest grains. Conservation fungus harm grains in various ways, lessen germination, produce bothersome scents and staining of oats, decrease the value of food and even produce poisons that are hurtful to customer health.

Moreover, prolonging storage period with high seed moisture percentage significantly caused high reduction in storage efficiency (infested seeds, damage grains percentage, grains weight loss percentage), germination characters, seed viability and quality, accelerate seed aging, revealed that storage duration of 12 months generally increased moisture and fat acidity, while decreased test weight and flour yield. It reported that the numbers of insect infestation and yellow grains of milled rice significantly increased due to increasing storage periods from 2 to 4 and 6 months from beginning of storage.

The Neem (*Azadirachta indica L.*) is a tree, which has many useful compounds, including azadirachtin and tetranotriterpenoid limonoid, the active ingredient in many neem-based insecticide. All parts of neem, especially seed oil possessed antifeedant, repellant, growth disrupting and larvicidal properties against a large number of pests.

Moreover, neem derivatives are generally not hazardous to the agro-ecosystem, as well as insect resistance is not developed like synthetic insecticides. It is indicated that neem seed oil showed 100% control of pulse beetles (*Callosobruchus chinensis L.*) applied at 10 ml/kg grain. Further it showed a positive potential of plant extracts as a suitable substitute for conventional synthetic insecticides for the management of insect pests attacking stored commodities. It is found that the maximum fortification of insects was attained by neem oil, where no grain injury was recorded by neem oil preserved grains and no adversative effect of plant oils was observed on seed practicality for up to 270 days of treatment. It is also concluded that the insect growth inhibition was increased by increasing the dose of neem seed powder from 0.5 % to 1.0 % and 2.0 % (w/w).

The important fumigants are Methyl bromide, Ethylene Di-Bromide, Aluminium phosphide, Ethyl formate, Hydrogen cyanide, Chloropicrin, etc. Phosphine fumigation offers a cost-effective method of treating grain so that insects are controlled. In this regard, it demonstrated that silo bags can be fumigated with phosphine for complete control of infestations of strongly phosphine resistant *R. dominica* and potentially other species. Finally, concluded that the release of gas in phosphine starts soon after the availability of the tablets on the atmosphere, increasing the concentration over time until complete termination of the tablet steaming.

It demonstrated that silo bags can be fumigated with phosphine (Aluminum phosphide tablets at the rate of 1.5 g/m3 with a fumigation period of 17 days) for complete control of invasions of strongly phosphine resistant *R. dominica* and hypothetically other species. Thus, it showed that the 50% lethal concentration (LC50) of phosphine to these "*R. dominica*" populations ranged from 0.017 to 4.272 mg/L.

Out of the 16 populations, 5 were of low resistance, 6 were moderately resistant, and 5 were high resistant. It is reported that treating wheat grains with some chemical insecticides treatment i.e., phosphine at the rates of 5, 7 and 9 ppm had a significant effect on storage efficacy traits (number of infected wheat grains, damage grains percentage and grains weight loss percentage) and final germination percentage as compared with both control treatments. It also suggested that seed of wheat can be stored in the open air while maintaining the seed of good quality in the moisture content does not exceed 14% after fumigation with phosphine in relative humidity up to 57%.

REFERENCES

1. Berghofer, L.K., Hocking, A.D., Miskelly, D. and Jansson, E. (2003). Microbiology of wheat and flour milling in Australia. International Journal of Food Microbiology, 85, 137–149.
2. Burgess, L.W., Summerell, B.A., Bullock, S., Gott, K.P. and Backhouse, D. (1994). Laboratory manual for Fusarium research. Sydney, Australia, University of Sydney.
3. Miller, J.D., ApSimon, J.W., Blackwell, B.A., Greenhalgh, R. and Taylor, A. (2001). Deoxynivalenol: a 25 year perspective on a trichothecene of agricultural importance. In: Summerell, B.A., Leslie, J.E., Backhouse, D., Bryden, W.L. and Burgess, L.W., ed., Fusarium. St Paul, MN, APS Press, 310– 320.
4. Marasas, W.F.O., Miller, J.D., Riley, R.T. and Visconti, A. (2001). Fumonisins — occurrence, toxicology, metabolisms and risk assessment. In: Summerell, B.A., Leslie, J.E., Backhouse, D., Bryden, W.L. and Burgess, L.W., ed., Fusarium. St Paul, MN, APS Press, 332–359.
5. Pitt, J.I., Dyer, S.K. and McCammon, S. (1991). Systemic invasion of developing peanut plants by Aspergillus flavus. Letters in Applied Microbiology, 13, 16–20.

6. Olsen, M. (2003). Postharvest formation of "Mycotoxins": a lack of knowledge or action? In: Barug, D. et al., ed., Abstracts of The Second World Mycotoxin Forum, Noordwijk, the Netherlands, 23–25.
7. Hocking, A.D. and Pitt, J.I. (2003). Mycotoxigenic fungi. In: Hocking, A.D., ed., Foodborne microorganisms of public health significance, 6th edition. Sydney, Australian Institute of Food Science and Technology Food Microbiology Group, 641–674.
8. Steel, R. G. D and J. H. Tome. (1980). Principles and Procedure of Statistics. McGraw Hill Book Co. Inc: New York, USA. 663p.
9. AACC. (2000). Approved Methods of American Association of Cereal Chemists. The American Association of Cereal Chemists. Inc., St. Paul, Minnesota, USA.
10. Ibanoglu, S. (2002). Wheat washing with ozonated water: effects on selected flour properties. Int. J. Food Sci. Technol., 37: 579–584.
11. Curic, D., Gˇ ugum, J. and Bauman, I. (2002). The influence of fungal aamylase supplementation on amylolytic activity and baking quality of flour. Int. J. Food Sci.Technol., 37:673–680.
12. Karaoglu, M.M., M.Aydeniz, G. K.Halis, and E.G. Kamil. (2010). A comparison of the functional characteristics of wheat stored as grain with wheat stored in spike forms. International Journal of Food Science and Technology, 45: 38–47.
13. Chen, X. and J. D. Schofield. (1996). Changes in the glutathione content and bread making performance of white wheat flour during short term storage. Cereal Chem., 73: 1-14.

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