Studies on maize grains deterioration under egyptian conditions

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This issue was carried out to study the changes in the Zea niays grains during storage such as fungi associated, kernel damage, moisture content, 100-grain weight and mycotoxin production (aflatoxins-ochratoxin A and zearalenone). The obtained data could be summarized as follows:1-Isolation from Zea mays ears at early harvest stage of different cultivars, which collected from the extension fields in Menofya Governorate emphasized the presence of several fungi associated with grains as follows:a-Sum of 697 isolates were recorded at zero time from the tested samples of early harvested corn ears collected from Menofya Governorate. The isolated fungi belong to 7 genera and 11 species and identified as: Cladosporium sp., Alternaria sp., Fusarium oxysporum, Fusarium sp., Aspergillus flavus, A. niger, Penicillium funiculosum, P. digitatum, Pencillium sp., Macrophomina sp. and Rhizopus sp.b-Macrophomina sp., Rhizopus sp., Cladosporium sp. and Alternaria sp. were recorded the highest percentage in all tested samples. Balady cv. recorded the highest frequency of isolated fungi, (135 isolate), followed by SC 122, (133, isolate) and TWC 352 (132, isolate). Dahab (50 isolate) and TWC 320 (27 isolate) hybrids recorded the least frequency of isolated fungi at zero time.2-Storage fungi such as Aspergillus flavus, A. niger and Fusarium spp. increased 15 days after comparing with zero time. Field fungi such as Cladosporium sp., Alternaria sp. and Macrophomina sp. were disappeared after 15 days.3-There were significant differences in the percentage of grain damage among the different tested samples.Summary1154-All samples under investigation were free from mycotoxins (aflatoxin, ochratoxin and zearalenone) at both zero time and after 15 days.5-Sum of 1809 fungal isolates were isolated from corn grains collected from 6 Governorates during the growing season 1998, (three Governorates represent Delta area i.e., Beheira, Sharkya and Nlenofya and three Governorates represent Upper Egypt i.e., Sohag, Assiout and Qena. Three samples of yellow corn (grade 2) were taken to represent main sources of imported corn grains (USA, Argentina and Hungary). The isolated fungi belong to 7 genera and 31 species. Aspergillus ’km’s followed by Ahernaria sp., Cladosporium sp. and Macrophomina phaseolina were the most frequent fungi in all tested samples.a.Aspergillus flavus recorded the highest occurrence on balady cv followed by single cross SC10 in Sohag Governorate, followed by balady variety, which collected from Sharkya Governorate, and double cross (Taba) grown in Behaira Governorate.b.Aspergillus ochraceus recorded also high occurrence percentage on grains of balady variety (14.5%) collected from Sohag Governorate, imported yellow corn from Hungary (11.2%) and SC 10 from Sohag Governorate (7.0%).c.Aspergillus clavatus, A. sydowii and A. tarnarii recorded the lowest occurrence percentages on tested corn grains where, A. clavatus was isolated only from balady variety from Assiout and SC 10 from Sharkya while, A. sydowii was found only on grains of hybrid (TWC 352) collected from Sharkya meanwhile, A. tamarii isolated only from single cross (SC 10) collected from Sharkya Governorate.d.Fusarium tabacinum recorded the highest occurrence percentage (13.4%) on grains of balady variety collected from Sharkya Governorate than others tested grains. On theSummary116other hand, Alternaria sp. recorded the highest occurrence percentages on varieties, hybrids and imported corn grains tested than all other isolated fungi.6-The highest number of isolated fungi was recorded on grains of balady cultivars collected from Menofya, Qena and Assiout respectively. Meanwhile, the lowest number of isolated fungi was recorded on grains of balady variety collected from Sohag followed by imported grains from Argentina and SC 10

from Sohag respectively. Aspergillus flavus was the highest frequent isolated fungus followed by Alternaria sp. Cladosporium sp., Macrophomina phaseolina and Fusarium nivale respectively.7-There were a large number of fungi associated with stored corn grains at different storage periods which differed in their isolation frequency number such as, Aspergillus flavus, A. ochraceus, A. niger, A. versicolor, A. terreus, A. clavatus, A. sydowii, A. parasiticus, A. tamarii, A. sparsus, Aspergillus. sp. Fusarium nivale, F. semitectum, F. oxysporum, F. tabacinum, F. tricinectum, F. graminearuni, F. culumorum, F. moniliforme, F roseum, Fusarium sp., Penicillium funiculosum, P. digitatum, P. chtysogenum, P. sztblateritum, P. palitans, Penicillium sp., Cladosporium sp., Alternaria sp., Macrophomina phaseolina and Rhizopus sp.8-Increasing the storage period, up to 12 months, has increased the frequency number of fungi i.e., Aspergillus flavus, A. ochraceus, A. terreus, A. niger, Fusarium nivale, F. tabacinum, F graminerum, F. culumonim, F moniliforme, F roseum, Penicillium fitnicztlosum and P. digitatum were increased during the first and second six months of storage comparing with their isolation at zero time.9-Some of isolated fungi at zero time were disappeared by storing corn grains for 12 months such as Cladosporium sp. and Macrophomina phaseolina. Meanwhile, some other fungi startedSummary117to appear during the first six months of storage although these fungi could not be isolated at zero time such as, Aspegillusclarants, A. sydown, A. tamarii, Frisariuni senntectuni, F tricinecnun, Perricillirnn sublaierinun and P. palions.10-It is clearly that Aspergillus flares and A. ochraceus, were associated with all tested corn grain samples at zero time. Aspergillus flavus was scored the highest number on all storedcorn grain samples (local or imported) during all storage intervals periods.11-Increasing the storage period from 2-12 months has gradually increased the damage grain percentages. It is clear also that there were significant differences in the damaged grain percentages between tested corn grains at the different storage periods. The least damaged grain percentage was recorded on both TWC 352hybrid (Sharkya) and Bashaaier-13 (Menofya) at zero time and after 12 months storage period.12-Increasing the storage periods to 12 months has decreased grain moisture content. Meanwhile, the only exception was clear in moisture content of stored corn grains of balady variety collected from Menofya during 0-12 months storage periods where slight changes happened. On the other hand, themoisture content increased in all samples up to 8 months storage period then decreased gradually.13-Increasing storage periods till 12 month decreased gradually the weight of 100-grains for all tested corn grain samples. Highest loss percentages were on Balady (Behaira), Balady (Qena),Balady (Menofya) and Taba hybrid collected from Behaira, respectively.14-All stored corn grain samples at zero time till 4 months storage were free from any mycotoxins (aflatoxins, ochratoxins and zearalenone). After 6 months storage period, only zearalenonemycotoxin was detected in small amount on grains of balady (Menofya).Summary11815-The highest amounts of zearalenone were recorded on balady (Behaira and Menofya) after 12 months storage respectively. Meanwhile, the highest amounts of ochratoxin were recorded in corn grains of Balady cv (Menofya) and SC 10 hybrid (Sharkya) respectively after the same storage period. Also, aflatoxin B1 was recorded in considerable amounts but higher than the amounts of B2 after 12 months storage.16-There were non-toxic amounts of aflatoxins, ochratoxin and zearalenone on stored corn grains of Balady cultivars collected from Sharkya, Sohag and Assiout, Nab-El-Gamal (Qena), local hybrids i.e., TWC352 (Sharkya), SC10 (Sohag) and Bashaaier (Menofya) and all imported corn grains after all storage periods till 12 month. Generally, it could be concluded that both the storage periods, source and variety of stored corn grains have affected the production of mycotoxins, either aflatoxins (B1 or B2) ochratoxins and zearalenone.17-The highest grain infection percentage was recorded on imported corn grains from USA, infested with A. flcmus followed by corn grains from Argentina infested with A. ochraceus after 12 months storage periods at room temperature. While, the least grain infection was recorded on Bashaaier 13 and Nab El-Gamal with A. flares after 12 months storage respectively. Moreover, high infection percentages were recorded on Hungary corn grains infested with A. flavus and A. ochraceus comparing with un-infested grains after 12 months storage period.18-Aflatoxins (B 1&B2) and ochratoxin A were not detected in all samples of stored corn grains till 6 months storage periods. On the other hand, the highest amounts of aflatoxins B1 and B2 were recorded on inoculated, stored corn grains of balady (Qena) after 12 months storage period. Ochratoxin A was

detected in infested stored grains of Nab El-Gamal (Qena) and the imported grains from Argentina and Hungary infested with A. ochraceus. Moreover, the highest amounts of ochratoxin A were recordedSummary119on infested, stored grains of Argentina corn, Nab El-Gamal and Hungary corn after 12 months storage period. Meanwhile, ochratoxin A could not be detected after 12 months storageperiods in infested grains of balady (Qena), and Bashaaier 13 (Menofya).19-Two preservatives i.e., thiourea and propionic acid formula (Salmo-Nil-Dry) have decreased the damaged grains. It was noticed that, all treated samples stored at room temperature have significantly less damaged grains compared with the untreated ones. No clear differences were noticed between treated and un-treated samples after 2 and 4 months. While,after 6-12 months storage, thiourea gave the best effect on stored corn grains.20-Propionic acid formula (Salmo-Nil-Dry), proved to be highly effective in preventing damaged grains where, the best results were obtained after 12 months storage period on treated grains of balady (Behaira), balady (Sharkya), balady (Menofya), balady (Qena), TWC.352 (Sharkya), and Bashaaier 13 (Menofya) respectively comparing with untreated ones. It is also clear that propionic acid formula has greatly decreasedgrain damage percentage on imported corn samples during all storage periods.21-There was a remarkable reduction percentages in aflatoxin (131-1-G1) production as a result for exposing A. ficnius (aflatoxin producer isolate) to different of electric waves reduction in aflatoxins (B1&G1) was gradually increased after exposing the fungus to doses started from 0.5-50Hz. The highest reduction percentage in aflatoxins (B 1&G1) wasrecorded with 50Hz while the least reduction percentage was recorded with 0.5 and 1.0 Hz.22-Increasing exposure periods from 1/2 - 24 hrs increased gradually the reduction percentage in total aflatoxin (B1+G1) production compared with control. The highest reductionSummary120percentages after exposing the inoculated media for 24, 12, 4, 3 and 2 hrs for 14 days respectively. Meanwhile, exposing inoculated media for V-2. hr gave the least reduction percentage in aflatoxins production at the same conditions.23-Exposing the inoculating medium with A. flavus to different electric waves started from 100-500 Hz increased aflatoxins production amounts especially aflatoxin G1 at 400, 300, 500 and 200 Hz. In the same time, the total aflatoxin amounts (BAG') were lesser than un-exposed ones. Moreover, the highest reduction percentages in aflatoxins production by using different exposure doses was at both 100 and 200Hz whereas the least reduction percentage were at 400 and 500Hz respectively.24-The reduction percentages in aflatoxins production was greatly high in medium inoculated with A flaw's daily exposure to electric waves at doses ranging from 600-800 Hz (alone or in combination) for 21days. The highest reduction percentages were 99.0, 98.0 and 95.1% at the combined electric wave doses i.e., (800+700+600+500Hz), (800+700+600Hz) and (800+700Hz) respectively. Meanwhile, aflatoxin B1 could not be detected. Exposing the inoculated medium with A. flan us for 21 days to individual doses of electric waves (600, 700 and 800Hz), resulted in high reduction in aflatoxins production but lesser than the combined doses at the same incubation period. It is clear also that increasing exposure time from 2-8 hrs increased gradually the reduction percentages in total aflatoxin production.25-Exposing YES medium to electric wave (700Hz) 6 hrs for 3 successive days before inoculation with A. flauts (aflatoxin producer isolate), led to inhibition of aflatoxin B1 and reduced the produced amount of aflatoxin G1 to lower level comparing with control (un-exposed). Meanwhile, the reduction percentage in total aflatoxins (B1 + G1) was 94.1% as a result for the previous treatment.Summary12126-Exposing the inoculated corn grains (25% moisture content) with A. flavus (producer afiatoxins) for 21 days to individual doses of electric waves (500 + 600 + 700 + 800 Hz). Aflatoxin productions were less than control. Exposing corn grains at the same moisture content but without inoculation to the same electric waves. The reduction in aflatoxin production was21.16%.27-The grains exposed to electric waves showed no changes in protein and total carbohydrates contents.28-Treating the inoculated YES medium with 2.5 gauss (magnetic field wave) revealed obvious reduction in total aflatoxin production. It is clear also that exposure periods played a great role in increasing the reduction percentages in aflatoxin production after exposing medium to magnetic field (2.5 gauss), whereas, the reduction percentages in total aflatoxins (B1&G1) reached 100% after exposing medium to the tested magnetic wave for 21day. Generally, increasing exposure periods from 1/2-21 days decreased gradually the produced amounts of aflatoxins (BAG!) comparing with control..Summary122