Pathological studies on grain rot in Maize in the field and during the storage

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The present investigation was planned to study the fungi associated with corn grains of maize hybrid’s (i.e. Taba, DC.204, Giza 2 and TWC.310).Effect of storage temperature, storage period, and maize hybrid’s (Giza 2 and TWC.310) on percentages of natural infection, moisture content, germination, infection with insects and weight of 100-kernels.Efficiency of some fungicides and preservative salts on inoculated and uninoculated grains one week before and after inoculation during storage was also investigated.Effect of harvest date and levels of nitrogen fertilization and plant density in the field on percentages of natural infection, moisture content, weight of 100-kernels and associated fungi were aiso undertaken.1 Several fungi were isolated from naturally infected corn grains of different corn cultivars. Fusarium monififorme, F. solani, F coeru/eum, F. oxysporum isolate No. 1, Aspergfilus niger, Penicfifium spp. isolate No.1 and Trichothecium roseum were isolated from Giza 2 cv., while F. oxysporum isolate No. 2, Aspergfilus flavus and Penicfifium spp. isolate No.2 were isolated from TWC.310 cv. However, Fusarium solani isolate 2 and F oxysporum isolate 3 from DC.204 cv. and Fusarium oxysporum isolate 4 and Penicillium funiculosum from Taba cv. could be isolated.2- Fusarium solani No.1 isolated from Giza 2 cv. and F oxysporum isolateNo.3 from DC.204 caused the highest infection to corn grains, while Penicifflum funiculosum was the lowest virulent among all tested isolated fungi. The disease caused by F. coeru/eum and F monififorme isolated from Giza 2 cv., was significantly higher than that caused by Trichotheciumroseum isolated from the same cultivar. While Aspergillus flavus was more pathogenic than A. niger.3-Corn grains of TWC.310 cv., in general, were more susceptable to infection with tested isolates than Giza 2 cv. Fusarium moniliforme, F. solani isolate No.1, F. oxysporum isolate No.1, 3 and 4, Aspergillus flavus and Penicillium spp. isolate No.2, were more virulent on TWC.310 cv. than on Giza 2 one, however, the opposite response was noticed in case of F. coeru/eum, F. oxysporum isolate No.2, F solani isolate No.2, Penicillium spp. isolate No.1, Trichothecium roseum and Penicillium funiculosum. However, corn grains of both TWC.310 and Giza 2 cvs., reacted equally against infection with Aspergillus4- Percentage of corn grains infected with rotting fungi were progressively increased with elevating storage temperature and with increasing storage period. The highest infection was associated with grains stored for 4 months at 27°C. After 4 months storage period, the rate of infection was higher on Giza 2 cv. than TWC.310 cv. especially at 27°C. The rate of infection was minimizedto great extent on corn grains stored at 5°C.- Moisture contents in corn grains was increased with elevating temperature at which they were stored. This was more evident in TWC.310 cv. than Giza 2 one. The increase in moisture contents was occurred at slow rate until the 2nd month of storage then enlarged and reached its maximum after 4 months of storage specially at 27°C in both tested maize cvs.6-The weight of 100-corn grains of a tested corn cv. was conspicuously decreased with increasing storage period and/or storage temperature. The rate of losses as affected by storage temperature was depending upon the tested cultivar,7-The total frequency of fungi associated with corn kernel after 4 months storage was more at higher storage temperature of (27°C.) than lower temperatures and on grains of TWC.310 cv. than Giza 2 one. At all tested storage temperatures, Penicillium spp. was the most common followed by Fusarium spp., Aspergillus flavus and A. niger, while frequency of Rhizopus sp. was lowered at 27°C. to greater extent. Frequency of A. flavus on grains ofTWC.310 cv. which was higher at 18°C than 27°C. while

frequency of Penicillium spp. on the latter cv. was equalized at both 18 and 27°C.8-After storage for 4 months at different temperature germination percentage of corn grains of Giza 2 was significantly higher than TWC.310 cv. However, it was decreased with increasing storage temperature especially on the latter cultivar.9- Percentages of corn grains infected with storage insects were increased proportionally with increasing storage temperature. The percentages of infection with insects was higher on corn grains of TWC.310 cv. than on Giza 2 cv.10-For controlling natural infection with corn grain-rot disease, and minimizing reduction in weight of 100-corn grains, Agrotic fungicide was the most effective followed by Thiourea and Rizolex in both Giza 2 and TWC. 310 cvs. The reduction in weight of 100-corn grains was increased proportionally with increasing storage period up to 4 months.11-Artificial inoculation with different combination of pathogenic fungi proved that A. flavus was the most destructive pathogen on grains of Giza 2 cv. especially when combined with F. oxysporum and F. monfliforme. The cultivar TWC. 310 was more susceptible to infection with the different tested inoculation trails than Giza 2 cv. All tested chemical treatments used one week beforeinoculation were highly effective for suppressing infection during storage period but Agrotic was the best chemical treatment followed by Thiourea and Rizolex after 4 months of storage. The weight of 100-corn grains was decreased as percentage infection was increased, however, it was affected similarly by tested chemicals and inoculation trails.12- Applying chemical treatments one week after inoculation with pathogenic fungi proved that Rizolex and ilrotic fungicides decreased percentages of infected corn grains while Thiourea increased it if compared with control (inoculated with pathogen(s) only). Compared with chemical treatment on week before inoculation, Infection percentage was increased greatly especially after 4 months of storage. At the later storage period and regardless inoculation trails Rizolex fungicide was the best for decreasing Infection percentage on both Giza 2 and TWC. 310 cvs.13-The weight of 100-corn grains in samples treated with chemicals one week after inoculation was lower than those treated one week before, however superiority of chemical treatments in both times of treatment was similar.14-Percentage corn grain germination was lower in case of applying chemicals one week after inoculation compared with applying it one week before. Germination percentage for corn grains of Giza 2 cv. was higher than TWC. 310 cv. Among all inoculation trails Aspergifius fiavus caused the highest decrease germination percentage in both cvs. The three tested chemical substances improved germination of corn grains even those uninoculated (control).15-Percentage of naturally infected corn grains during storage was affected significantly by treatments of N-fertilization and plant population density performed under field conditions. In general and regardless plant density,increasing level of N-fertilization led to significant decrease in percentages of infected grains. Applying N3D3 treatment gave the lowest percentage of infection at 0-time, after 3 or 6-months of storage in case of DC.204 and TWC.310 corn cvs., while, N3D2 was the best treatment in case of Giza 2 cv. in both seasons. Both N3D3 and N3D2 treatments in this regard, were effective in case of Taba cv.16- The heaviest weight of 100-corn grains in both seasons were produced by applying N3D2 for Taba and Giza 2 cvs., and by N3D3 for both DC.204 and TWC.310 cvs. On the other hand, regardless plant densities, applying the low level of N-fertilization (N1) produced the lowest weight of 100-corn grains in all tested corn cultivars. After 6-months of storage period in both seasons, the highest weight of 100-corn grains was associated with applying N3D2 for Taba cv., N2D3 and N3D3 for DC.204 cv.; N3D2 and N2D3 for Giza 2 cvs. and N3D2 and N3D3 for TWC.310 cv.17-Regarding with kinds and frequencies of fungi associated with corn grains as affected by treatments of N-fertilization and plant population density the results showed that F. oxysporum was most common at 0-time of storage on corn grains of NI,D3 and N2ID, in 1992 season and NilD2 and NiD3in 1993 season. However, in 1992 season F. moniliforme on N2D, and F. sp. on N2D3 and N3D2 were dominated but both fungi were most common on N3D3 treatment in 1993 season. Aspergillus flavus and A. niger were dominated on corn grains of NiD2 treatment in 1992 and 1993 seasons, respectively. but it was never isolated from any treatment in 1993 season. In 1992 season Penicaum sp. was dominated on corn grains of NI,D, while Rhizopus mgricanswas most common on N3D3 treatment. The fungi, Altemana sp., Epicoccum sp., Helminthosporium sp. and Nigrospora sp. (refered herein as other fungi) were dominate in 1992 season only on corn grains of N3D, treatment. At 0-timeof storage, the lowest frequency was associated with corn grains of N3D2 in 1992 season and N3D3 in 1993

season for F. oxysporum; N,D3 and N,D2 in both seasons for F. moniliforme and F. sp., respectively. Aspergillus flavus was never isolated from any treatment in 1993 season and isolated only from N,D, , N2D, and N3D2 treatments in 1992 season. A. nigerwas not isolated from all plant densities combined with levels of N, or N2 in 1992 season and occurred at its lowest frequency on corn grains of N,D, treatment in 1993 season. Penicillium sp. was not isolated from grains of N3D2 and N3D3 in 1992 season and N,D3 in 1993 season. However, Rhizopus nigricans and those refered as other fungi , were isolated only from N3D3 in 1992 and 1993 seasons, respectively.18-After 6-months of storage, frequency percentages of F. oxysporum, F. moniliforme, F. sp. and Aspergillus niger in both seasons and refered as other fungi in 1992 season were decreased while A. flavus in both seasons and Penicillium sp. in 1993 season were increased compared with their frequencies at 0-time. At this time the following fungi were completely absent or occurred at its lowest frequencies on corn grains produced from N2D3 in both seasons for F. oxysporum, N2D3 in 1992 season and N3D, and N3D3 in 1993 season for F. moniliforme, all treatments in 1992 season and N2D2 only in 1993 season for F. sp., N3D3 in both seasons for Penicillium sp., N3D,, N3D2 and N3D3 for Rhizopus nigricans N,D3. The fungi refered as other fungi were never isolated from corn grains of N3D3 in both seasons. Frequency of A. flavus was minimized on corn grains of N3D3 in 1993 season but it was completely absent in those of N,D3 in 1992 season. The lowest frequency of A. niger was associated with N,D3 and N3D, in 1992 and 1993 seasons, respectively.19-As for harvesting date, the percentage of infected corn grains was decreased with increasing harvesting date up to 120 days. At 0-time and after 6-months of storage, corn cultivar TWC.310 gave the lowest percentage of infected corn grains followed by Pop-45 and Taba cvs. Delaying harvesting date up to 120 or 110 days caused significant decrease in infection in grains of Taba cv. stored for 6-months compared with 100 days.2 - Average weight of 100-corn grains was significantly increased with increasing harvest date up to 120 days. It was significantly higher in TWC.310 cv. than Taba and Pop-45 cvs. at all tested storage periods. Weight of 100-corn grains was significantly decreased with increasing storage period up to 6-months. At the latter storage period, Pop-45 cv. showed the lowest weight of 100-corn grains. After 6-months of storage, no significant variation was found between 110 and 120 days.21-The highest percentage of moisture contents for a given corn cultivar was observed at 0-time of storage. It was decreased by increasing storage period to 3-months then increased again after storage for 6-months. Percentage of moisture content in corn grains was clearly decreased with increasing harvesting date up to 120 days. At any tested storage period, corn grains of TWC.310 cv. contained the lowest percentage of moisture content.22-After 6-months of storage, percentage of corn kernel germination for a given corn cultivar was relatively increased with increasing harvest date up to 120 days. TWC.310 cv. gave the highest percentage of germination followed by Taba then Pop-45 cvs.23-Fusarium sp. was the most common fungus at 0-time of storage on corn grains of Taba cv. harvested after 100 days followed by Aspergillus niger, Penicifilum sp., R. nigricans and A. fiavus, respectively. However,Aspergillus niger and Penicillium sp. followed by Fusarium sp. were dominated on corn grains harvested after 110 days. In case of harvesting date of 120 days, R. nigricans and A. mgeronly were isolated at 0-time of storage. After 6-months of storage, the most common fungi were Penicillium sp. followed by Fusarium sp. in case of harvesting dates of 100 and 110 days and A. niger and Penicillium sp. in case of harvesting after 120 days. At 0-time A. niger was isolated at relatively low frequency from corn grains harvested after 100 days only but its frequency after 6-months of storage was relatively higher on corn grains harvested after 120 days than after 110 or 110 days. For any tested harvesting date especially after 120 days, A. flavus was relatively higher after 6-months of storage on Pop-45 than Taba