Effect of some agricultural treatments on the yield and technological properties of some maize cultivars

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FIRST STUDYThree field experiments were conducted at theResearch and Experimental Station of the Faculty ofAgriculture at Moshtohor. Ka1ubia, Egypt in 1982, 1983and 1984 seasons. to study the effect of nitrogen fertilization.plant density and sowing depth on growth, yieldand yield components, chemical and technological propertiesof .aize cultivar Pioneer 514. Each experillentincluded four rates of nitrogen fertiliLer (0, 40, 80, 120kg N/fad.) two plants density (1 plant/hill, 2 plantslhill) and 3 sowing depth. The treatments in the threeseasons were arranged in split-split plot experimentaldesign 1n five replications. The area of each sub-subplot was 10.5 m2 (3.5 x 3 m) with 5 ridges which were 70 cmapart and 3 length. The distance between hills was 30 cmapart. The phosphorus fertilizer was applied at a rateof 24 kg P205 per faddan in a fOrM of calciull super phosphate(16% P205) before sowing.Characters studied:I. Growth .easure.ants:-Gera1nation percentage-fresh and dry weight of seedlingat IS days after sowing tille.- 177 -- Two growt h samples we re taken from eac h plot after 45and 75 days from sowing time to estimate the followingcharacters:Plant height - Ear height - Stem diamete r - Numbe r ofleaves per plant - Fresh and dry weight of roots, stem,leaves and ears per plant - time of tasseling andsilking - Leaf area of the topmost ear - chlorophyll a,b, a+b and carotenoids contents.11- Yield and yield compo~ents:Percentage of barren, lodged and broken plants -Percentage of plants carried one and two ears - Number ofears/plant - Length and diameter of ears - Nu.ber of grainsper row and per ear - Ear weight - grain weight per ear -Ear yield and grain yield per plant - laO-grain weight -Shelling percentage - Ear, grain and straw yield perfaddan.III. Chemical and Technological properties:N, P and K content in grains of .aize - Hectolitterweight - Percentage of teste, e.bryo and endospenn -Crude protein - Protein yield per fad. - Oil percentage -Oil yield pe r faddan.---------- 178 -The following are the most important results:I. Growth measurements:A. Effect of nit rogen ferti11ze r rates:1. The plant height, stem diameter at 45 and 75 days aftersowing time and ear height at 75 days were not significantlyincreased by increasing N level up to 120 kg N/fad.2. The number of leaves /plant at 45 days after sowing timewas significantly affected by nitrogen fertilization inthe two seasons out of three. On the other hand thenumber of leaves/plant at 75 days after sowing time wasnot significantly affected nitrogen rates in the twoseasons out of three.3. The fresh and dry weight of roots, stem and leaves pe rplant in both samples and frash and dry weight of ears/plant at 75 days after sowing tille were not significantlyaffected by increasing N level up to 120 kg/faddan.4. The time of tasseling and silking. ear leaf area,chlorophyll a. b, a+b and carotenoids content were notsignificantly affected by nitrogen fertilization in allstudied seasons.B. Effect of plant density:1. The plant height at 45 and 75 days after sowing tillsand ear height at 75 days we re not sign ificantly affectedby increasing nUliber of plants/hill in the three seasons.2. The stem diame ter was significantly inc reased by decreas-:Lng the numbe r of plants per hill by the first sallple in- -------- ---------- 179 -1983 and 1984 seasons and by the second sample duringthe three growing seasons. One plant/hill gave themaximum stem diameter.3. The number of leaves/plant in both samples, fresh anddry weight of ears/plant at 75 days after sowing timeand time of tasseling were not significantly affectedby plant density during the three growing seasons.4. The fresh and dry

weight of roots and 0 f leaves per plantat 45 days after sowing time were significantly increasedby decreasing numbe r of plants/hill in the two seasonsout of three but these characters at 75 days after sowingtime we", not significantly affected in the two seasonsout of rh ree,5. The fresh weights of stem/plant at 45 and 75 days aftersowing time were significantly affected by plant densitydu ring the two seasons out of three. On the at her handthe dry weights of stem/plant in both sa.ples were notsignificantly affected by plant density in the threegrowing seasons.6. The time of silking was significantly increased byincreasing number of plants/hill, .eanwhile leaf areaof the topmost ear was significant.7. The chlorophyll a, b and total chlorophyll wene notsignificantly affected by plant density 1n both seasons.On the contrary the caratenoids content was significantlydecreased by increasing plant density in one season outof two.- 180 -c~ Effect of sowing depth~1. The germination percentage. fresh and dry weight ofseedlings at 15 days after sowing time we re significantlyincreased by increasing sowing depth from 3 emto 6 em. There were no significant differencesbetween the average values of fresh and dry weight ofseedling at 6 em and 9 em depth.2. Plant height. ear height. stem diameter and number ofleaves per plant were not significantly affected bysowing depth at 45 and 75 days after sowing time duringthe three growing seasons with one exception for theplant height at 45 days after sowing. that was significantlyincreased by increasing sowing depth in the twoseasons out of three •3. The fresh and dry weight of roots. stem. leaves. perplant in both samples, fresh and dry weight of earslplant at the second sample were not significantlyaffected by sowing depth.4. The time of tasseling and silking and leaf area of thetopmost ear were not significantly affected by sowingdepth in the two seasons out of three. The greatestvalues of these characters were obtained by sowingdepth at 3 c_.S. The chlorophyll (b) and total chlorophyll were significantlyinc reased by increasing 80wing depth up to6 em in one season out of two. The highest average- 181 -value of chlorophyll (b) and total chlorophyll were3.96 and 4.118. respectively, obtained from sowingdepth at 6 em in 1983 season only. On the contrarychlorophyll (a) and carotenoids were not significantlyaffected in both seasons.D. Effect of the interaction:The effect of the interaction between plant densityand sowing depth on the ave rage values of stem diamete rand fresh weight .of stem at 45 days after sowing time weresignificantly affected in the two seasons out of three.The interaction between one plant/hill and sowing depthat 6 em gave the highest ate m diamete rand frash weightof stem pe r plant.11- Yield and yield components:.A. Ef feet of nit rogen fe rtilize r rates :1. The percentage of barren, lodged, broken plants andthe percentage of plants carried one and two ears werenot significantly affected by nit rogen fertilizationduring the three seasons.2. The number of ears/plant and nuebe r of row per ear werenot sign ificant ly inc reased by inc reasing N level up to120 kg/faddan in the combined analysis.3. The length and diaMeter of ear. nuabe r- of grains per rowand per ear. ear weight. grain weight per ear. ear- andgrain-yield per plant were signif1.cantly increased by--" --" ---------- 182 -increasing N level up to 40 kg/fad. in the combinedanalysis between the three growing seasons. Howeverno significant difference were obtained by 40, 80 and120 kg N/fad.5. The shelling percentage and lOO-grain weight were significantlyaffected by nitrogen fertilization 1n thecombined analysis.6. The ear, grain and straw yield per faddan were notsi9nificant ly a ffected by nitrogen fert ilizat ion durin gthe three seasons. On the other hand ear yield/faddanwaS significantly affected in cOMbined analysis. Theear yield, 9rain yield and straw yield pe r faddan we reinc reased by increasing N level up to 80 kg/fad.B~ Effect of plant density:1. The percentages of barren and broken plants were significantlyincreased by inc reasing nuabe r 0 f plants/hill.One plant!hill gave the lowest percentage of barren andbroken plants during the three growing seasons.2. The percentage of lodged plants waS not significantlyaffected by plant density.3. The percentage of plants carried one and two ears weresignificantly affected by increasing nu.ber of plants/hill. One plant/hill gave the highest percentage ofplants carried two ears.--- ---- ---------- 183 -4. The number of ears/plant, ear length, ear diameter,number of grains per row and per ear, ear weight, grainweight/ear, ear yield and grain yield per plant weresignificantly increased by decreasing the number ofplants per hill in the combined analysis.5. The number of rows/ear and lOO-grain weight weresignificantly affected by plant density in the combinedanalysis.6. The shelling percentage was not significantly affectedby plant density.7. The ear-, grain- and straw-yield per faddan were significantlyincreased by increasing the numbe r of plantsper hill during the three gruwing seasons

as well as inthe combined analysis. Two plants/hill gave the highestear-, grain- and straw yield per faddan.c~ Effect of sowing depth:1. The percentages of barren. lodged a9 well as brokenplants and the percentage of plants carried one ear andtwo ears were not significantly affected by increasingsowing depth from 3 cm to 9 ell.2. The yield components characters i.e number of ears/plant,ear length, ear diaMeter, number of ~ws/ear, number ofgrains per row and per ear, ear _ight, grain weight/ear, ear- and grain-yield per plant, shelling percentageand lOO-grain _ight _re not significantly affected bysow1ng dept h._. -_._---- 184 -3. The ear-, grain-and straw-yield per faddan were significantlyaffected by sowing depth in the combined analysis.The sowing depth at 9 cm gave the highest yield of ear,grain and stfaw per faddan, whereas no difference wasobtained between sowing depth at 6 cm and at 9 cm inthese characters.0 .. Effect of the interactions:1. The ear yield per plant was significantly affected bythe interaction between plant density and sowing depthin combined analysis. The highers ear yield per plantwere obtained from one plant/hill with sowing depth at6 cm or at 9 cm.TTT. Chemical and technological properties:A. Ef feet of nit rogen fertilize r rates:1. N”content and crude protein percentage of Ilaize grainwere Significantly increased by nitrogen fertilizationrates up to 40 kg in one season out of two. Howeverno significant difference between 40, 80 and 120 kg N/fad was obtained.2. P and K content, hectolitte r weight, the percentage 0 ftesta, embryo and endosperM ingrain, protein yield,.•.oil pe rcentege and 011 yield pe r faddsn we re notsignificantly affected by n1trogen fert11ization in,bot h seasons.B. Effect of plant density:1. N content, crude protein percentage of ••aize grain,Hectolitter weight and oil yield/faddan were significantlyaffected by plant density in one seaSon out oftwo. One plant/hill gave the highest N content andcrude protein, but two plant/hill gave the highesthectolitter weight and oilyield/faddan.2. P and K content, the percentage of testa. embryo andendospenn in grain. protein yield/faddan and oilpercentage were not significantly affected by plantdensity in both seasons.c. Effect of sowing depth:1. N, P and K content, hectolitter weight, crude proteinpercentage, protein yield and oil percentage were notsignificantly affected by sowing depth in both seasons.2. The percentage of testa, embryo and endospenn in grainand oil yield/faddan were significantly increased byinc reaSing sowing depth from 3 c ••to 9 cm in oneseason out of two.D. Effect of the interactions:1. The interaction weight was significantly affected bythe interaction between nitrogen fertilization andsowing depth in one season out of two. The interactionbetween sO kg N/fad. and sow1ng depth at 6 c. gave thehighest hectolltter weight.2. The percentage of tests per grain was significantlyeffected by the interaction between plant density andsowing depth and by the interaction between nitrogenfertilization, plant density and sowing depth in oneseason out of two •