effect of some nutrients and methods of application on the yield and quality of flax (linum ustatissimum, l.)

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. Effect of SomeNutrients and Methods of Application on TheYield and Quality of ; Flax. (Linumusitatissimum, L.)The yield am Quality of FlaxThe aim of this investigation was to study the effectof nitrogen fertilizer levels, nitrogen forms aDi methods offertilizer application as well as the effect of SOIll!l micronutrientson the yield and quality of flax. This study wasconducted at Bahtim Agricultural Research Station, KalUbiBGovernorate d~~ing 1977/78. 1978/79 aDi 1979/80 seasons. ~woexperiments were carried out in each season.The soil of the experiments was clay loam, with apH value of about 8.3 and contained about 1.92 % organic matter.A split-plot design with four replications was used for allexperiments. The sise of the sub-plot was 8.4 m2(J.5 x 2.4 m)•• 1/500 fad. The seeding rate was 65 kg/fad. in each experimentin the three seasons. Flax cultivar Giza 4 was used in thisinvestigation. The first experiment included 12 treatmentswhich were the combination of three Napplication methods amfour Nfertilizer levels.Napplication methods were: soil appl:W.ation, soilspray and foliar spray.Nlevels were: Zez:o".10. 20 am 30 kg/fad.Characters studieda. straw charaoters: plant height, techniea1 length andstraw yield (kg/fad.).b. Seed characters: number of fruiting branches,number ofoapsules/plant, seed index, seed yield (kg/fad.), oil percentageand oil yield (kg/fad.).d. Fiber characters: fiber yield (kg/fad.), fiber percentageand fiber fineness.The second experiment included 24 treatments whichwere the combination of three forms of nitrogen fertilizer and8 treatments of micro-nutrients.Nitrogen fertilizer forms were: ammonium sulphate(20.5 % N), ammonium nitrate with lime (33.5 % N) and urea(46 % N). Nitrogen level was 30 kg N/fad.Micro-nutrient treatments were: Control, Zn, Cu, Mn,Zn + cu, Zn + ~m,Cu + Mn and Zn + Cu + 1ill1.Micro-nutrients were sprayed twice at a concentrationot 0.1 %. T~e first spray was done at a rate of 300 l/fad. at43 days from sowing and the second spray was at a rate of 600I/fad. at 64 days from sowing.Amounts of Mic~o-nutrients applied were:3.927 kg/fad. of ZnS04,7H20 (Zn).3.534 kg/fed. of CUS04, 5H20 (cu)',1.412 kg/fad. of MnS04• H20 (Mn).!rhese amounts were applied when these nutrients were" used in81Dgle ar in mixed application as well.Four plant sample s were ta;cen in the secord am thirdexperimental seasons at 42; 63, 84 and 165 days from sowingfar dry weight determination and chemical analysis,All data mentioned in the former experiment were alsoreoarded here in:addition to ary weight/plant and estimationof N, P, K, Zn, Cu and Mn contents. Results could be summar1zedas follows:J'IRST EXPlRlMENl'I. ~ct of .methods of nitrogen applicationN application methods had no significant effect onplant height, technical length, straw yield, number of fruitingbranches per plant' number of capsules/plant, seed ;index,seed yield, oil percentage, oil yield, fiber percentage, fiberfineness and fiber vyield in the three seasons, except thelatter character which was favourably affected by soil applicationand soil spray in the thir4 season only.Generally, soil application could be recommended asan efficier-t method of N applicatio~,SECONDEXPERIMENrI. Effect of nitrogen fertilizer forms1. :Plant height, techninal length am straw yield were notsignificantly affected by Nforms in the three seasons.,2. Ncarriers had no significant effect on number of fru.itingbranches, number of capsules/plant, Beed index, sseed yield, oil percentage and oil yield,J. The t hr-e e Ncarriers, used were of similar effect onfiber yield, fiber fineness and fiber percentage,It could be concluded that amid, ammoniumand

nitrateare equally effective as nitrogen fertilizers for flax, graonin Egypt.II. Effect of micro-nutrient.s1. Plant height, technic a1 length and straw yie ld were notsignificantly affected by micro-nutrient treatment s in thethree seasons.2. Treatments including Mneither alone or in combinationswith Cu>+ Zn were superior to other treatments in theireffect on the number of fruiting branches plant and numberof capsules/plant.J. Mioro-nutrients showedno significant effect on seed yieldam seed index in the three seasons.4. Oil percentage and oil yield signif'i) antly increased whenMnand Cu were applied either alone or in combinations.5. Fiber fineness was signifioahtly affected by "micronutrientsspecially Cu whenapplied either alone or incombination with Zn and Mn. Fiber yield and fiber percentagewere not affected by micro-nutrient application.III. Interact~cn effectThere was no signif'ican1i ~1ietIIIeS1Nfcl!m&":d·"'onutrientson all characters studied in the three seasons.IV. Dry weight1. Dry weight/plant was signif'icantly affected by 1~formsduring the different stages of growth in both seasons ofdet erminat ion.2. Micro-nutrient application had significant effect OD dryweight/plant and seed weight/plant in both seasons. Thehighest dry weight were obtained "benZn and Mnwere appliedeither alone or in combinationlJ, whereas the highestseed dry weights weN given by Mnand Cu either aloneor in cambinations.3. Dry weight/plant was sign1ficantly affected 'by the interactionbetween B forms and Illioro-nu;trient s at 63 days inboth season and at 84 days in 1978/79 season. also, seed dryyweight/plabt was significantly affeoted by that interactionin both seasons.V. Chemical content:a. nNitrogen co~teni1. lIhere was no olear trend forthe superiority of a certainli oarrier on Nperoentage and Noontent in'·plant and seed.2. Npel'ClEltltagime reased significantly as a result of micronutrientapplioation. Best results were obtained WhenZn,Cu and MIl were applied in combinations.3. The interaction between N forms and micro-nutrients hada significant effect on Noontent at 63 and 165 days in1978/79 and at 63, 84 and 165 days in 1979/80. Seed Ncontent was also affected"by this interaotion in 1978/79only.b. Phosphorus oontent1. N forms were iDgenera1 of equal eff':l.cienoy on P percentagein flax plant at different gr wth stages.At harvest, P content of plant and seed was f'aYou:--rably affected with urea in 1979/80 season While the threeforms gave a similar effect in 1978/79 season.2. Kic"o-nutrient app1:lcation caused an increase' in Pboth seaBon ani at 84 days in 1978/79 season. also, seed dry'Sweight/plabt was significantly affected by that interacti.onin both seasons.V. Chemical.contentsa.. nNitrogen c0!1ten~1. ~ere Viasno clear trena forthe superiority of a certain:tl carrier on Npercentage and Ncontent in' .plant afJd seed.2. Npe~abs imreased significantly as a rewlt of micronutrientapplication. Best results were obtained when Zn,Cu and Mnwere applied in combinations.J. The interaction between N forms ani mic~o-nutr:iSnts hada significant effeot on Ncontent at 63 and 165 days in1978/79 ani at 63, 84 ani 165 days in 1979/80. Seed Ncontent VlSSalso affected"by this interact1.on in 1978/79only.b. Phosphorus content1. N forms were ingeneral of equal efficiencY' on P percentagein flax plant at different gr wth stages.At harvest, l' content of plant and seed wa. fa.OI1~·rably affected with urea in 1979/80 season wh1.lethe threeforms gave a similar effect in 1978/79 season.2. MicI1o-nutr1.entapplication caused an increase' in Ppercentage in flax at different growth stages as well aelat harvest in both seasons, while micro-nutrient applicationincreased P percentage in seed only in 1978/79season.3. The interaction between N forms and micro-nutrient shada significantly effect on P content at 63, 84 and 165days frOE sowing in 1978/79 and at 63 and 165 days in1979/80. Also P content in seeds was significantly influencedby the interact ion between N forms and mieronutrientoin both seasons.c. Pota8s11lillcontent1. K content in".plant and seed was favourably affected byammoniumnitrate in 1978/79 season, whereas wuree.wasmore effective in 1979/80 at later stages of growth.2. Micro-nutrient application had no effecton K percentagein seed in 1978/19 and 1979/80 seasons. In general, allmicro-nutrient treatDllnts increased Kuptake as comparedwith the control as a result of increasing dry mattercontent.3. Kuptake by flax plants was s18nificptly affected by Nforms x micro-nutrient interaction at 63, 84 and 165 claysin 1978/79 season. K content in seeds was significantlyaffected by this interaction 1D both seasons.d. ~i!lc content1. N forme had no clear effeot on Zn conoentration in plantbut Zn content {ug/plant} respo11ded to N farms as a reaultof an increase in dry matter content.2. Zn conoentration was affected by micro-nutrient application.The highest Zn concentration at 165 d~Y8was obtainedfrOI1l plant streated with Zn + Cu in 1978/79 aM Zn +Mnin 1979/80 seaeons. MicrQ-nutrient applicationencou::::agedthe uptake of Zn by flax.3. Zn

conter ..t ’.11 flax was significantly affected by the 11 interaotion ·~twedn N forms and micro-nutrients at 63 and165 dayF. i~ ~~78/79 and at 63, 84 and 165 days in 1979/80season. Also Zn content in seed was significantlTaffect~~by this interaction in 1978/79 season only.e. Conpp~ content1. Cu co’lcentration was markedlr af:tected by N torms in bothseasons. A~onium nitrate an1 urea eMouraged Cu uptakeby flax.2. The h;.p;l:est Cu concentrations were observed when Cu -.applied either alone or in combinations with Zn and Mn.). Micro-nutrients ingeneral am Cu in particu.lar markedly1ntluenced Cu uptake by flax.