Evaluation of efficiency of some n-slow-release fertilizers under different rates of phosphatic fertilizers

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Nitrogen application to soils has greatly increasedin the past 10 years. Millions of tons of N fertilizers havebeen added to soils at each year, often disregarding thepossible decrease in the efficiency use when losses of Noccurred. Ammonium N is oxidized to NO-3- N in mo~t soilsduring all seasons except when environmental conditions areprohibitive. If N could be kept in the NH+. form until plantutili~ation. less N loSS would occur. The n$t result wouldbe greater Nuse efficiency.The ideal fertiliz~r m~y be considered as orie that(1) needs only a single application to ’supply the amounts ofnutrients required for optimum plant growth during theentire growing season, (2) has:high maximum percentage recoveryin order to achieve higher return to production input.and (3) has minimum detrimental effects on soil. water andatmospheric environments. In recent years considerableinterest has been evident in controlled- release N fertilizersto regulate the supply of nitrogen of the plant through-out the growing Beason, thus minimizing N losses andmaximizing the efficiency of the applied N in terms ofuptake and yield.The purpo8~ of this study was to evaluate the efficiencyof some N- slow- release fertilizers applied alone orin combination· with phosphatic fertilizers. The researchwork embodied in this investigation included four experiments:1- First green-house experiment:The first green~ house experiment was carried out inthe summer season of 1992 at the Giza Farm, Soils and WaterResearch Institute, to evaluate both direct and residualeffect of N source, i.e. ammonium nitrate, ammonium sulphate,urea, seu, UF and Kpp- UF combined with calcium superphosphatefor corn grown on an alluvial caly loam soil.The obtained results could’be.8WD11larized as follows1- Regardless P appli~ation, most of the N sources,except urea and seu showed almost similar irowth responsepattern where’ dry matter, ’cyieJd ins isniff cant;lyincreased : , -,’,.1with N application a8comp;a~e:(Ito original treat.m’entsafASand AN, which were equally eftictive.2- The slow- release fertilizer KPP- UF (alone) andseD combined with 15 kg P205/ fed. were the most effictive ..treatments in respect to corn growth followed by UFo3- Corn plants increased gradually .Ln their contentof N, P and K by increasing the rate of applied Buperphosphate.On the other hand KPP- UF showed the higheststimulative effect on P and Kcontent of corn plants.4- KPP- UP and seu produced the highest values of Nuptake by corn plants when they were added in combinationwith superphosphate.2- Nitrogen and potassium losses from clay 100m soil treatedwith sol~ble and slow- release fertilizers under cornand fallow:]- Values of total leached soluble N (NH4+ + No”::’3)during 9 weeks were maximized under fallow conditions. Inrespect to NH3 loss, the highest figures were observed underfallow condition. while. the rate of loss was decrease withN fertilization according to the orderAS > AN > Urea > seu ’) KPP- UF .2- Leaching 10s8 of Nij+4- N is negligible eitherunder fallow conditions or with corn cropping during theexperimental periods. Only with AN and seu, the N loss wasnot appreciable under fallow till the 6th week. but AN wasvery low only under cropping at the same period.3- Appreciable NO-3-N could not be detected •i. n leachatesof soil treated with either seu Or ~pp- UF under fallowor under corn cropping. AI_ost similar trends were alsoobtained with the total amount~ of N leached.4- It is very much interesting to observe that theloss of soil K through leaching was minimized. in case of KPP-UF fertilization.5- The amounts of Nand K leached at from the treatmentsof AN, AS. urea. SCU

and’KPP-UF explain the dry matteryield of corn results. KPP- UF and SCU produced higher dryweight of corn plants and N. P arid K uptake than the otherN- sources.11- Field experiment:A field experiment was established at Bahteem AgriculturalResearch Station on a clay loamy soil for threesuccessive growing season durirg 1989 and 1990. Sunflowerplant (”elianthus annuus L.) cv. Giza 1 was grown on theexperimental site in 1989. A wheat (L..aestivuIQ L.) crop.cv. Sakha was grown in October season. 1989. followed bycorn plant (Zea mays L.)cv. ,Giza 2.In the first trial ur~a was applied at 45 kiN/fed.in two equal doses. i.e. just before sowing and before the3rd irrigation. The slow release fertilizers KPP- UF and UFwere added at the same rate in one dose. just before sowing.Superphosphate was applied in two doses. i.e. 15 a..nd 30 kgP20!/ fed.. however. potassium sulphate was added at 24 kgK20/ fed. as a basal dress to all experimental plots beforeplanting. Thus. there were 3 N- treatments having Nfertilizers+ 15 kg P20S and another 3 N- treatments having30 kg P20S/ fed~ besideth.e control treatlnebnt in a COllpleterandomized block desigp with four replicates.The obtained results are su•••a•rlzed as follows;1,- Fertilization with”,readily soluble or slow-releaseN-fertiJizers in sunflowerp!ant enhanced plant, height stemdiameter. head diameter and~husk percent compared with theuntreated one.2- There was no signi!icant difference in t~e vegetativecharacteristics: ~eed,weight per plant, yield of seedsand weight of 100 seed (seed index) of sunflower plant. Oilconcentration in the seeds was increased as P20S additionwas increased from 15 to 30 kg P20S/ feddan.3- Slow- release fert£lizers have the disadvantagethat they are not suitable for crops that require considerablesupplementals of nitrogen through a short growth period.In such case a supporting dose of readily soluble N may over-come this disadvantage.4- The application of slow- release tertil’izers combinedwith 15 or 30 kg P20~/ fad., resulted in higher dryweight of wheat plants as compared with the soluble releaseones, or with the control.5~ The dry weight of wheat plants obtained from theuntreated plots ammounted to about 50 ’I. of that producedfrom plots treated with the recommended treatment. With KPPUFfertilization. the reduction was decreased by 10 ’I. onlycomprising about 90 ~ of the yield in case of recommendeddose fertilizer.6- There is a positive significant influence in nutrientsuptake by wheat plants with slow-release fertilization.The order of increase in nutrients uptake was asfollows UF 45 kg N/ fed. + 30’kg P20!5 / fed. > KPP- UP 45kg N/ fed. + 30 kgP:iOe/:,fed.) KPP- UF 45 kg N/ f~d. + 157- A stimulation effect on plant height. ..number of ’tillers and number of spikes ~er plant was gradually dbservedcomparing ~he slow- rel~ase fertilizer.withthe solubl~one. The residual effects of KPP- UF treatments was observedto give the highest values either by the application of 45kg N + 30 kg P20S / fedd~n or by 45 kg N + 15 kg P20!5/ fed.as compared to the application of urea.8- Considering the residual effect due to N f e r t il izationon grain yield of wheat plants; the obtained responsedecreased in the following order : 45 kg N as KPP- UF + 30kg P203/ fed. ; 45 kg N as UF + 30 kg P20!l / fed. ; 45 kg N asKPP- UFo 45 kg N as urea + 30 kg P20!l / fed. ; 45 kg N asurea + 15 kg P20~ / fed. and the controlled plants.9- With respect to straw yield of wheat planted aftersunflower, the residual effect due to slow- release fertili-~er seems to be adequate either it was added alone orcombined with 15 or 30 kg P20lS/ feddan.10- The residual.effectfromKPP- UP and UP eitheralone or associated with S5 kg/ fed. ure~- N, aignificantlyenhanced the length of ear~the number 6f ears per plant, thediameter of ear and the shelling percent of corn as comparedto unfertilized plots, but there were no significantdifferences between them and the values obtained under therecommended treatment.11- Regardless of the effect of residual treatmentscombined with superphosphate, a compensation rate w~s generrallyadequate to corn yield. the preference of the slowreleasefertilizers i. eminent.Ammonia loss byvolatilization:1- In calcareous soil, ~he obtained results revealedthat NH3 loss generally followed this descending. order of :AS > urea > AN > KPP-Of > UF > SCU, within 4 weeks period.The rate of volatilization from AS and urea was much greaterthan from AN.2- The risk of NH310ss increases in sandy soil, andthe treatments had the following descending order:AS > Urea > AN> KPP- UF > UF > seu.3- The greatest values of NH3 loss were observed inclay loam soil treated with urea and AS. While NH3 loss fromKPP- UF, seu and UF occurred to 8 less extent.