Effect of slow release and readily soluble nitro gewous fertilizer on the avalability of some macro and micro-naturients

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This research was conducted to compare between effect of slow release nitrogenous fertilizers and that of readily available nitrogenous fertilizers on the availability of some macro and micro-nutrients in soil in presence or absence of added ZnSO4. Also, the comparison was extended to involve the effect of these N-fertilizers on dry matter yield of rice plant and its content of N, P, Fe, Mn and Zn. The used fertilizers were urea and ammonium sulfate as readily available N-fertilizers and ureaform and ureaform-Zn as slow release N-fertilizers.To fulfill the purposes of this investigation, incubation experiment was conducted in which each nitrogenous fertilizer was thoroughly mixed with 100 g portions of the clay soil in plastic pots at the rates of 0, 50, 100 and 150 mg N Kg-1 soil. Incubation was conducted under flooded conditions in presence and in absence of added ZnSO4 for a period of 12 weeks; within this period, samples were taken at intervals of 0, 1, 2, 4, 8 and 12 weeks and analysed for N, P, Fe, Mn and Zn.The obtained results could be summarized in the following: 1. Nitrogen:•The highest values of extractable N were obtained from soil upon treating it with the ammonium sulfate in presence of added ZnSO4 and ureaform-Zn in absence of added ZnSO4.•The highest values of extractable N were obtained at end of the second week of incubation.Summary108• The values of soil content of N extracted by K2SO4 increased as a result of increasing rate of the applied nitrogenous fertilizers to soil.2. Phosphorus:•The values of extractable P increased with application of the nitrogenous fertilizers however, these values were highest at the time zero beyond which P tended to decrease.•Ureaform-Zn treatment gave the highest values of extractable P.•Values of extractable P were lower in presence of ZnSO4 than in its absence.•The values of P extracted increased as a result of increasing rate of the applied nitrogenous fertilizers to soil.3. Iron:•Incubating nitrogenous fertilizers with soil decreased extractable Fe in all treatments.•The decrease was more obvious by increasing rate of the applied nitrogen fertilizers.•On the other hand, extractable Fe increased with increasing period of incubation up to the 121E week. This occurred with all the nitrogenous fertilizers combined with or without added ZnSO4.4. Manganese:•Incubating nitrogenous fertilizers with soil increased extractable Mn and the increase was more pronounced by increasing rate of the applied N fertilizer.Summary109•The highest values of extractable Mn were obtained from the ammonium sulfate treatment.•Values of extractable Mn were high in presence of ZnSO4 then the corresponding values where ZnSO4 was not added.•Increasing period of incubation up to the second week seemed to increase Mn extractability.5. Zinc:•Values of soil content of extracted Zn increased, as it was expected, due to application of ZnSO4.•The ureaform-Zn treatment resulted in the highest extractable Zn values.•Values of soil content of extracted Zn increased as a result of increasing rate of the applied urea, ureaform and ureaform-Zn, however, these values tended to decrease with addition ammonium sulfate.•Increasing period of incubation up to 8 weeks resulted in increase in values of extractable Zn.II. Pot experiments:A)The rice experiment:In this experiment, plastic pots were uniformly packed with five-kilogram portions of the investigated soil and mixed with the applied nitrogenous fertilizers, i.e. urea, ammonium sulfate, ureaform and ureaform-Zn at rates 0, 50, 100 and 150 mg kg”’ soil.The pots were divided into two sits, the first of them was treated with ZnSO4 at

the rate of 10 mg Zn kg’ soil and theSummary110second was left untreated (without added ZnSO4). Seven-rice grains were planted in each pot, moisture content of soil was flooded.The obtained results could be summarized as follows:I. Dry matter yield:•Dry matter yield of the rice plants increased due to application of the N-fertilizers, the increase seemed more obvious upon increasing rate of the applied N-fertilizer.•Ureafonn-Zn (without added ZnSO4) was the N treatment that resulted in the highest values of dry matter yield of grains and straw and consequently the whole dry matter yield. Thus occurred when the N-fertilizers was applied at a rate of 100 mg N kg-I.•Values of dry matter yield were higher when ZnSO4 was added together with N-fertilizer than the corresponding values achieved in absence of ZnSO4. This was true when the N-fertilizer was urea, ammonium sulfate or ureaform, however an opposite trend was attained when ureaform-Zn was the added N-fertilizer.II. Uptake of some nutrients: 1. Nitrogen uptake:•Values of N uptake by rice plants increased due to application of the studied N fertilizer, the increase was more pronounced when rate of the applied N-fertilizers was increased.Summary111•The highest values of N uptake by rice plants were obtained from the soil treated with ureaform-Zn (with or without added ZnSO4) at the rate of 100 mg N kg”’ soil.•Application of ZnSO4 increased N uptake by rice plants.2. Phosphorus uptake:•Application of N-fertilizers increased P uptake by rice plants, the increase was higher when rate of the applied N fertilizers increased.•The highest mean value of the whole P uptake was obtained from ammonium sulfate (with added ZnSO4) treatment.•Application of ZnSO4 increased P uptake by rice plants.3. Iron uptake:•Application of N-fertilizers increased significantly Fe uptake by rice plants.•The highest values of Fe uptake by rice plants were obtained from the soil treated with ammonium sulfate (with added ZnSO4) and ureaform-Zn (without added ZnSO4).4. Manganese uptake:•Application of N-fertilizers increased Mn uptake.•The highest Mn uptake value was obtained from ureaform-Zn (with applied ZnSO4).•Values of Mn uptake by rice plants increased with increasing rate of the applied N-fertilizers (with or without applied ZnSO4) in all treatments, except for urea withoutSummary112applied ZnSO4 treatment where Mn uptake decreased by increasing rate of the applied N-fertilizers.•Application of ZnSO4 increased Mn uptake by rice plants. 5. Zinc uptake:•Application of N-fertilizers increased Zn uptake by rice plants in all treatments.•The highest Zn uptake value was obtained from ammonium sulfate treatments at a rate of 150 mg kg-1.•Values of Zn uptake by rice plants increased with increasing rate of the applied N-fertilizers.•Application of ZnSO4 increased Zn uptake by rice plants. B) Wheat experiment:•where ZnSO4 was applied, the residual effect of readily soluble N-fertilizers (urea or ammonium sulfate) was higher than that of slow release N-fertilizers on the whole dry matter yield as well as grains and straw yields.•where no ZnSO4 was added, the residual effect of the slow release N-fertilizers (ureaform or ureaform-Zn) was higher than that of readily soluble N-fertilizers on yields of both grains and straw as well as the total dry matter yield.•The higher the rate of the applied nitrogenous fertilizer, the higher the dry matter yields of both grains and straw and consequently the whole plant.