Effect of nitrification inhibitors on efficiency of nitrogen fertilizers

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The aim of the present work was to study the effect of nitrification inhibitors N - Serve (NS) or dicyandiamide (DeD) on the efficiency of nitrogen fertilizers; urea (U) or ammonium sulfate (AS). To achieve this goal, wheat was selected as an indicator plant. Plants were treated with 15N enriched ”U” or ”AS” which was applied solely or jill combination with NI . Another experiment was conducted using U or AS and NI in presence and absence of Azotobacter inoculation. The growth parameters, dry matter yield, nitrogen uptake, fractions of nitrogen uptake by soil, plant and air were computed to evaluate the N - balance by means of the tracer technique (15N - isotopic dilution concept). Also quantitfy the N2 fixed via nonsymbiotic association. and fertilizer use efficiency (FUE %) were been computed . A - The first experiment was conducted to elucidate the effect of N - source, NI and inoculation of wheat seeds with Azotobacter on wheat plants. The obtained results and conclusions-of this experiment could be swmnarizedas follows: 1 - Application of chemical fertilizers (AS or U) at a rate of 50 and 100 kg.fed” , either solely or in combination with nitrification inhibitor (NS or DeD) progressively increased significantly the dry matter yield of wheat, straw and grain as well as the total N - uptake over the control. 2 - Inoculation of Azotobacter increased dry weight of wheat straw by 79.5 and 83.7 g Pot” and grain by 66,5 69.7 g Pot” for U or AS respectively.However, values of increments obtained in uninoculation treattnent were68 and 70.4 g Pot’ in straw and 55.2 and 57.2 g Por ’ in grain for U orAS , respectively.3 - The FUE values of wheat grain ranged from 25.9 % to 4~.4 % following the order: AS > DeD > U + nco > AS + NS > U NS > AS > U . However , the FUE values of wheat grain were in e range of 22.7 to 41.9 4 - Values of the N2 - fixed by wheat plants were 177.9 ,1 mg N Por’ instraw and 282.1 , 303.5 mg N Por’ in grain for U or A ,respectively. 5 - Inoculation of wheat seeds with Azotobacter increase N r covery by plantto range of 42.7 to 69.7 % , while plant recovery w uninoculated seedes was in the range of 37.5 % to 66.8 % , followed the descending order: AS + DeD.> U + DeD > AS + NS > U + 6 - Loss of N was reduced du to inoculation of Azotobacter from 54.1 % to 25.8 % . While losses reduced to 30.3 5 , and N - 10 ses reached the lowest value (25.8) when AS was applied with DeD in presence of wheat seed in inoculation with Azotobacter . B. The second experiment was conducted to _stl!dYth effect of N - fertilizers form , methods of N placement (surface or subsurf: e) and type of NI (DeD or NS) on wheat plants. ”' Results and conclusions of this experiment could be summarized as follows: 1 - Addition of 100 kg N.fed-1 as enriched U or AS either al ne or combined with NI (DCDor AS) increased both dry weight of (heat straw and grain) as well as N - uptake over the control. 2 - Application of AS with DCn gave the highest values when AS + DCn was applied on soil surface where subsurface application was moreefficient in increasing dry weight of wheat plants, N - uptake Ndff andFUE. 3 - Application of 15N labelled U or AS to subsurface increased dry weightof wheat straw to 76.5 and 79.3 g.Por’ and wheat grain to 64.3 or 66.6g.por1 for U and AS , respectively. The corresponding values increasedonly to 68 and 70.4 g.Pot’ in straw and 55.2 or 57.2 g.Pot’ in grain withsurface placement of N - fertilizer.4 - Fertilizer use efficiency (FUE) values were in the range of 20.7 % to29.4 % in straw and 32.8 % to 51.6 % in grain in case of subsurface placement, while with surface placement were in the range of 14.8 % to 24.9 % in straw and 22.7 % to 41.9 %. in grain following the order: AS + DCD > U + DCD > AS + NS > U + NS > AS > U. 5 - Plant recovery of 15N labelled U and.AS ranged from 53.5 % to 81 % in case of subsurface

placement . However, plant recovery in surface placement was in the range from 37.5 % to 66.8 % . 6 - The N loss from U and AS as a.ffected by the method of fertilizer application and presence of N inhibitors ranged from 44.3 % to 15.1 % in case of subsurface placement ” but were reduc due to surface placement from 60.5 to 30.3 % . lbese losses were astically reduced (to 15 %) with surface placement and in presence of the inhibitor (DCD). Both methods of N fertilizer management , show si .ficant effect on minimizing N - loss and increasing in plant recovery.