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5. Summary and Conclusion

Two field experiments were conducted at Ismailia agriculture research station, during two growing seasons of 2008-09 and 2009-10 to study the integrated effect of bio, inorganic and organic fertilizers on the productivity of canola plant (Brassica napus L.) (cv serw 4).

The first experiment include, dual inoculation with (N-fixing bacteria) at two rates (no seed inoculation) and (seed inoculation), compost application at rates (0, 5 and 10 ton/ fed) and mineral N-fertilizer at rates (0,40, 60 and 80 kg N/fed).

The second experiment include, dual inoculation with (PDB+VAM fungi), compost application at rates (0,5 and 10 ton/fed) and mineral P-fertilizer at rates (0, 30, 45 and 60 kg P_2O_5/fed).

The experimental design was laid out in spilt-spilt design with three replications.

-The obtained results could be summarized as the following:

5.1. Effect of bio,organic and inorganic nitrogen fertilizers on canola plant:

5.1.1. Growth characters:

All plant growth characters, i.e. plant height, dry weight and number of branches/plant were affected significantly by the individual application of biofertilizer, compost (10 ton/fed) and N-fertilizer (80 kgN/fed) or their combined application on plant growth characters of canola plant in both seasons.

5.1.2. Yield and Yield components:

The individual application of biofertilizer, compost at a rate of (10 ton/fed) and N-fertilizer at rate (80 kg N/fed) caused 5.30 and 5.20 % and 22.80 and 23.0 % and 66.0 and 67.40 % in seed yield of canola plant during two seasons, respectively over the control treatment.

It is worthy to note that the combined treatment of 80 kg N/fed of N-fertilizer did not statistically differ than of 40 kg N/fed plus 10 ton/fed compost or 60 kg N/fed combined with 5 ton/fed compost in absence of bio-fertilizer. Also the combined interaction of 40 kg N/fed plus compost at a rate of 10 ton/fed and bio fertilizer with N-fixing bacteria gave seed and straw yields of canola plant over soil fertilized with 80 kg N/fed of N-fertilizer alone. This mean that inoculated seed of canola plant with N-fixing bacteria plus addition of compost at a rate of 10 ton/ fed, substitute half of the recommended dose from the used mineral nitrogen fertilizer.

5.1.3. Seed quality:

As for seed quality of canola, it was also found that protein content, oil and protein yields per fed were significantly increased by the integrated effect of bio,organic and inorganic-N fertilizers particularly in the combined treatment of 40 kg N/fed of N-fertilizer and compost at a rate of 10 ton/fed plus dual inoculation with (AZT+AZS) which gave results better than using of 80 kg N/fed solely. While oil content was decreased by the high rate of nitrogen application (80 kg N/fed) alone, but it increased with the addition of bio and organic fertilizer.

5.1.4. Nutrient contents and uptake:

N and K contents in shoots of canola plant at 90 days after sowing as well as seed and straw were significantly increased by increasing mineral- N fertilizer, while P content was decreased with increasing N-fertilizer from 0 up to 80/ kg N/fed in absence of bio, organic fertilizers.

Also N, P and K uptake in shoots of canola plant at 90 days after sowing as well as seed and straw at harvesting were responded to the integrated application of bio, organic and in organic N- fertilizers, particularly the combined treatment of (40 kg N/fed) plus bio fertilizer with N-fixing bacteria and 10 ton/ fed compost application in both seasons.

5.2. Effect of bio,organic and inorganic phosphorus fertilizers on canola plant:

5.2.1. Growth characters:

Application of phosphorus fertilization from 0 up to 60 kg P_2O_5/fed induced significant increased in all plant growth characters of canola plant at 90 days after sowing in both studied seasons.

Also, in all plant growth characters of canola plant there were no significant differences between compost at a rate of 10 ton/fed plus 45 and 60 kg P_2O_5/fed of phosphorus fertilizer solely . It worthy to note that, application of (45 kg P_2O_5/fed) as combined with compost at a rate of 10 ton/fed plus dual inoculation with (PDB + VAM fungi) resulted in plant growth characters better than application of (60 kg P_2O_5/fed) of in mineral form solely.

5.2.2. Yield and yield components:

All yield and yield components of canola plant i.e. number of pods/plant, 1000-seed weight, seed and straw yields were enhanced and increased significantly by increasing phosphorus fertilization from 0 up to 60 kg P_2O_5/fed in both studied seasons.

Application of compost at a rate of 10 ton/fed combined with dual inoculation with (PDB + VAM fungi) significantly increased seed and straw yields over the control treatment.

The integrated fertilization of biofertilizer and compost application at a rate of 10 ton/fed plus 45 kg P_2O_5/fed of P – fertilization gave values in all yield characters higher than using of 60 kg P_2O_5/fed of P-fertilizer solely. Moreover, using of 30 kg P_2O_5/fed of P-fertilizer as combined with compost at a rate of 10 ton/fed plus bio fertilizer resulted in seed yield of canola plant equal to or better than application of 45 kg P_2O_5/fed fed in mineral form solely.

5.2.3. Seed quality:

Seed quality of canola plant i.e. oil and protein contents and yields were affected significantly by increasing mineral P-fertilization. The highest significant increase in oil, protein contents and yields were recorded by using of 60 kg P_2O_5/fed of in mineral form.

Also addition of compost at rates of 5 and 10 ton/fed in combination with any level of P-application gave higher oil, protein contents and yields. The integrated fertilization of bio fertilizer with (PDB + VAM fungi) as combined with 45 kg P_2O_5/fed of P–fertilizer plus compost at a rate of 10 ton/fed

resulted in oil and protein yields higher than application of 60 kg P_2O_5/fed of in mineral form solely in both the studied seasons.

5.2.4. Nutrient contents and uptake:

Nitrogen and potassium in shoot dry weight for canola plant at 90 days after sowing as well as in seed and straw at harvesting were not affected significantly by phosphorus application while, N and K uptake in seed and straw were increased significantly by P-fertilization in both seasons. Phosphorus content and uptake at flowering stage as well as seed and straw at harvesting stage were increased significantly by increasing P-fertilization in both studied seasons.

Application of compost at a rate of 10 ton/fed in the presence of bio fertilizer with (PDB + VAM fungi) gave higher NPK uptake in seed and straw as compared with the control treatment.

Also the treatments received P-fertilization (45 and 60 kg P_2O_5/fed) combined with compost at a rate of 10 ton/fed showed no significant differences in NPK uptake for seed and straw

Application of P–fertilizer at a rate of (45 kg P_2O_5/fed) combined with compost at a rate of 10 ton/fed plus dual inoculation with (PDB+VAM fungi) gave NPK uptake in seed and straw higher than application of 60 kg P_2O_5/fed in mineral form solely in the two studied seasons. This mean that, the combined treatment could be reduce the amount of applied phosphorus which required to canola plant nutrition and to minimize the environmental pollution.