SUMMARY AND CONCLUSION

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Two separate field experiments on sweet pepper (Capsicum annuum L.) cv. California Wonder were carried out at the Experimental Farm of the Faculty of Agriculture, Moshtohor, during the summer seasons of 2000 and 2001. The farm had a clay loam soil with pH 7.5. Sowing of Sweet pepper seeds took place in the nursery at 15 th January and transplanting took place in 24 th March in both seasons of this study.

5.1. First Experiment :

Effect of biofertilizer application on vegetative growth, chemical constituents, flowering, yield and fruit quality of sweet peppers.

The aim of this experiment is to investigate the effect of inoculating seeds and transplants roots of sweet pepper cv. California Wonder with a single or mixed biofertilizer; Nitrobin and/or Phosphorin. This experiment included 17 treatments as follows :

Treatments from No. 1 to 5 received Nitrobin as a single biofertilizer alone or with 0 , 25 , 50 or 75% of the recommended N-dose (80 kg / fed.), however P and K were added at the standard level of 64 kg P_2O_5 + 96 kg K_2O /fed. Treatments from No. 6 to 10 received Phosphorin alone or with 0 , 25 , 50 or 75% of the required P-level. (64 kg P_2O_5/fed.), however N and K were added at the standard level of 80 kg N + 96 kg K_2O /fed. Referring with mixed

biofertilizer treatments; it received Nitrobin + Phosphorin alone (treatment No.11) or with 0 , 25 , 50 or 75% each of the required N and P_2O_5 dose (treatments No. 12-15) added to standard level of potassium (96 kg K_2O /fed.). The two control treatments i.e. treatment (No. 16) received only 100% NPK as mineral fertilizers (80 kg N + 64 kg P_2O_5 + 96 kg K_2O/fed.) and treatment (No. 17) did not receive any bio or chemical fertilizers application (without both bio and chemical fertilizers).

The 17 treatments were arranged in a randomized complete block design with four replicates. Obtained results revealed the following :-

1. Vegetative growth characteristics :-

Plants received mixed biofertilizer of Nitrobin + Phosphorin + 3/4 N + 3/4 P + K (treat. No.15) showed the most favorable effect on plant growth parameters i.e. plant height , stem diameter , number of leaves , leaf area and dry weight per plant followed by those received the full dose of NPK without biofertilizers (treat. No.16) or those received Nitrobin + Phosphorin + 1/2 N + 1/2 P + K (treat. No.14). This trend held true at either 70 or 100 days after transplanting and during both seasons of the experiment.

2. Chemical composition of leaves and plant foliage :

A. NPK uptake :

Inoculating plants with Nitrobin and/or Phosphorin significantly increased NPK uptake in the two growth stages and this increase was significant and gradual with increasing levels

of N and/or P application from 25%, 50% upto 75% of each element. Therefore, the maximum NPK uptake/plant was obtained from (treatment No.15) when transplants was inoculated with Nitrobin + Phosphorin and fertilized with 3/4 N + 3/4 P + K in both seasons at the two stages i.e. (70 and 100 days after transplanting). On the other hand, plants supplied with NPK in the mineral form without any biofertilizers (treatment No.16) accumulated less NK at 70 days after transplanting or less NPK at 100 days after transplanting as compared with plants supplied with a mixed biofertilizer + 3/4 N + 3/4 P + K . This trend was true in both seasons and results could be referred to the role of Nitrobin and Phosphorin on increasing NPK uptake.

B. Chlorophyll content of leaves :

Plants inoculated with Nitrobin + Phosphorin + 50% or 75% of both NP + K and those received 100% NPK without biofertilizers gave similar and higher chlorophyll A,B and total as compared with all other treatments, as shown in both seasons. Moreover, a mixed biofertilizer (treatment No.11) and a single biofertilizer (treatment No.1 and 6) significantly increased chlorophyll A and total chlorophyll over the control when no bio or chemical fertilizers were added, with no significant differences in chlorophyll B as shown in both seasons.

3. Flowering and fruit setting :

Plants inoculated with Nitrobin + Phosphorin + 75% of both NP + full K (treatment No. 15) flowered 8 days earlier and fruit setting percentage was increased from 30.8 up to 65.9 as compared with the control treatment No. 17 (without bio or

mineral fertilizers). Moreover, treatment (No. 15) did not significantly increased fruit setting or enhanced flowering time as compared with solely NPK mineral fertilization (treat. No. 16).

4. Early and total fruit yield :

Inoculating seeds and roots of transplants with Nitrobin and/or Phosphorin increased early and total yield per plant and per feddan as compared with the control when no bio and chemical fertilizers were added in both seasons. Moreover, inoculation with Nitrobin and/or Phosphorin added to 0, 25, 50% of NP required dose gradually increased early and total yield. Whereas, no significant increase in total yield was obtained when plants inoculated with single biofertilizer; Nitrobin or Phosphorin + (50 or 75%) of NP required dose as chemical fertilizers.

As a general conclusion inoculating seeds and roots of transplants with mixed biofertilizers; Nitrobin + Phosphorin and adding 75% of the erquired NP + K (treatment No.15) could be recommended thus it increased early yield/fed. by 7.14-10.58% and total fruit yield/fed. by 4.42-4.53% as compared with the control which received 100% NPK without any biofertilizers, in both seasons. Treatment No.15 also increased fruit early yield per fed. by 1.6-6.4 times and the total yield/fed. by 4.5-4.9 times as compared with the control (No. 17) without bio and chemical fertilizers application, in both seasons.

5. Quality of sweet pepper fruits :

Treatments inoculated with mixed biofertilizer; Nitrobin + Phosphorin +3/4 N +3/4 P + K (treatment No.15) or that fertilized with 100% NPK in the mineral form without biofertilizers (No. 16) gave the highest fruit length, diameter, average fruit weight as compared with other treatments, in both seasons.

Concerning with the best fruit quality; fruit acidity, T.S.S, vitamin C, plants received NPK fertilizer without any biofertilizers (treatment No.16) or those received Nitrobin + Phosphorin + 1/2 N + 1/2 P +K or Nitrobin + Phosphorin + 3/4 N + 3/4 P + K (treatments No.14 or 15) gave similar fruit quality with high constituents, as shown in both seasons. With respect to sugar content of sweet pepper fruit; plants received all NPK fertilizers in the chemical form (treatment No.16) or received 75% of the required N and P (treatment No.15) expressed the highest non reducing and total sugars content. This result confirm the role of biofertilizers Nitrobin and Phosphorin on saving 25% of the required level of each element and getting the best fruit quality.

Conclusion

As a general conclusion inoculating seeds and roots of transplants with a mixed biofertilizers; Nitrobin + Phosphorin and fertilized with 75% of N and P required level; (60 kg N + 48 kg P_2O_5 + 96 kg K_2O) gave the highest growth, early and total yield per feddan with the best fruit quality of sweet pepper, cv. California Wonder when grown in clay loam soil. You can save

25% of N and P fertilizer level by adding Nitrobin and Phosphorin.

5.2. Second Experiment :

Effect of organic fertilizer application on vegetative growth, chemical constituents, flowering, yield and fruit quality of sweet peppers.

This experiment was carried out to investigate the response of sweet pepper plants cv. California Wonder to 4-organic N-sources within 4-methods of N-application in order to produce high yield of sweet pepper fruits with less contamination.

Therefore, this experiment included 16 treatments, 4-organic fertilizer sources (Biogas, FYM, Chicken manure and Agrolig) within 4-methods of N-application (60 kg N-organic only, 60 kg N-organic + PK, 30 kg N-organic + 30 kg N-mineral + PK and the control treatment supplied with 60 kg N-mineral + PK as 64 kg P_2O_5 and 96 kg K_2O) .

Experimental treatments were arranged in a randomized complete block design with 4 replicates. Obtained results revealed the following:-

1. **Vegetative growth characteristics :-**

Data of organic fertilizer sources indicated that plants fertilized with Biogas gave the best vegetative growth characteristics; plant height, No. of leaves, leaf area, fresh and

dry weight per plant followed by Chicken manure, Agrolig and FYM.

Methods of N-application show that the most favourable growth of sweet pepper plants was obtained by using 60 kg mineral-N + PK or 30 kg organic-N + 30 kg mineral-N + PK as general trend.

Data of interaction between sources and methods of N-application show that using 30 kg organic-N as Biogas + 30 kg mineral-N + PK gave the best result in most characteristics of plant growth especially plant dry weight as compared with all used treatments. This trend held true at either 70 or 100 days after transplanting and during both seasons of the experiment.

2. Chemical composition of leaves and plant foliage :

A. NPK uptake :

Adding Biogas led to the highest uptake of N and K followed by Chicken manure, and Agrolig, however, FYM showed the lowest N and K uptake, as a general trend in both seasons and in two stages of plant growth.

Methods of N-application show that adding 30 kg organic-N + 30 kg mineral-N + PK, gave higher and similar N and P uptake to that treatment which received all N in the mineral form, as a general trend in both seasons. However, adding 50% of N as organic and 50% as mineral (30 kg organic-N + 30 kg chemical-N + PK) gave the highest K uptake, as shown in both seasons and in the two stages of plant growth.

Data of interaction between sources and methods of N-application show that adding 50% of N fertilizer requirements in the organic form (30 kg N) especially as Biogas or Chicken manure + 50% as mineral-N (30 kg N) + PK could be recommended to increase N, P and K uptake of sweet pepper plants. than adding all nitrogen fertilizer requirements (60 kg N/fed.) in the organic or mineral form.

B. Chlorophyll content of leaves :

Data show that using 60 kg organic-N without PK led to the lowest content of chlorophyll-A and/or B in leaves, in both seasons. Furthermore, adding 50% of nitrogen within all used organic sources (Biogas, FYM, Chicken manure or Agrolig) + 50% mineral-N + PK gave higher chlorophyll-B content and equal with that of the control of plants received 100% of N as mineral form as shown in both seasons.

3. Flowering and fruit setting :

Using 30 kg organic-N within any source (Biogas, Chicken manure, Agrolig and FYM) + 30 kg mineral-N + PK gave the highest fruit setting with earlier anthesis and equal to that of the control (which received 60 kg mineral-N + PK) in both seasons.

4. Early and total fruit yield :

With respect to early and total yield per plant or feddan, Biogas, Chicken, Agrolig and Farmyard manure were significantly differed from each other in a descending order.

Plants supplied with 100% N only in the mineral form (60 kg N/fed. + PK) or those received 50% N in the organic form +

50% in the mineral form (30 kg organic-N + 30 kg mineral-N + PK) gave high early and total yield (ton/fed.) as compared with the other N-methods in both seasons.

Concerning with the interaction between sources and methods, data show that treatments received 30 kg N in the organic form (Biogas or Chicken manure) + 30 kg N in the mineral form + PK, gave the highest early yield per plant and per feddan, as a general trend in both seasons. Treatments received 30 kg N in the organic form (Biogas manure) + 30 kg N in the mineral form + PK, gave the highest total yield per plant and per feddan in both seasons. Whereas, treatments received 30 kg N in the organic form (Chicken manure) + 30 kg N in the mineral form + PK, came in the second rank with respect to total yield and equal with the control (60 kg as mineral-N + PK). However, plants supplied with 60 kg N as FYM only gave lowest early and total yield as compared with all other treatments.

5. <u>Quality of sweet pepper fruits :</u>

Using 30 kg N as Biogas + 30 kg mineral-N + PK gave larger fruit size, average fruit weight and the best chemical properties (acidity, T.S.S, vitamin-C) as compared with all other treatments, in both seasons. Data also show that using 30 kg mineral-N + 30 kg N as Chicken manure comes in the second rank with respect to its effect on fruit quality (physical & chemical) , as shown in both seasons.

On the other hand, using 50% of the required nitrogen as FYM or Agrolig decreased or gave similar fruit quality as compared with that of plants received 100% of the required N in

the mineral form (ammonium sulphate). This result indicate the superiority of adding 50% of nitrogen fertilizer as Biogas or as Chicken manure.

Data on sugars content show that increasing the quantity of organic-N application (form 30 upto 60 kg N) decreased non-reducing and total sugars content of sweet pepper fruits but increased its reducing sugars. In this regared, plants supplied with 60 kg organic-N + PK had lower non-reducing and total sugars than those supplied with 30 kg organic-N + 30 kg mineral-N. Therefore, the highest non-reducing and total sugars content was obtained in fruits of plants fertilized with 60 kg mineral-N.

Generally, using 30 kg organic-N as Biogas + 30 kg mineral-N + PK gave the highest total sugars content of fruits followed by using 30 kg organic-N as Chicken manure + 30 kg mineral-N + PK, as shown in both seasons.

6. Heavy metals content of sweet pepper fruits :

Adding organic manures within any used source (Chicken manure, Biogas, Agrolig and FYM) in a descending order increased the concentrations of heavy metals, i.e. Pb, Ni and Cd in pepper fruit. Whereas, addition of 60 kg organic-N within any source + PK show the highest values of Pb, Ni and Cd ppm concentrations in pepper fruit, in both seasons. However, adding 60 kg N in mineral form gave the lowest values of heavy metals accumulation in fruits.

Whereas, addition of 60 kg organic-N as Chicken manure + PK gave the highest relative values of Pb, Ni and Cd ppm

concentrations but is still less than the critical limits permitted to be found in normal plants.

Conclusion

It can be generally concluded that sweet pepper plants supplemented with 30 kg N in the organic form (Biogas manure) + 30 kg N in the mineral form (ammonium sulphate) + 64 kg P_2O_5 + 96 kg K_2O , gave the most favourable growth, the highest early and total yield per feddan with the best fruit quality of sweet pepper plants, cv. California Wonder grown in clay loam soil.