Studies on production of clean sweet pepper

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SUMMARY & CONCLUSIONTwo separate field experiments were carried out on sweet pepper (Capsicum annuum L.) cv. California Wonder at the Experimental Farm of the Faculty of Agriculture, Moshtohor, Benha university, during the summer seasons of 2004 and 2005 and during the winter seasons of 2005/2006 and 2006/2007. The experimental farm was of a clay loam soil with pH 7.9. In the summer seasons, sowing seeds took place in the nursery in 15 th January and transplanting took place in 24 th March in both seasons of 2004 and 2005. But in the winter seasons sowing of sweet pepper seeds sowed in the nursery at 10 th and 15 th August in 2005 and 2006 respectively, transplanting took place in first of October 2005 and 4 th October 2006. The experimental treatments in two field experiments were arranged in a split-splitplot design with 3 replicates. 5.1. First Experiment :"Effect of N-fertilizer sources, biofertilizer inoculation and foliar spray with Delfan or garlic extract on growth, yield and fruit quality of sweet peppers grown in summerseason"This experiment included 18 treatments which were the combinations of three factors; three N sources, two biofertilizer treatments and three foliar spray treatments as follows:N-fertilizer source:1.}lops at 60 kg N/fed.2.Mineral fertilizer at 60 kg N/fed. as (NH4)2SO4. (20.5%N).3.Biogas at 30 kg N/fed. + 30 kg N/fed. as (NH4)2SO4. lliofertilizer.,1.Without biofertilizer2.Inoculation with biofertilizer (Microbin) Foliar spray treatments:1.Without foliar application (Control)2.Foliar application by amino acids (DELFAN)3.Foliar application by garlic extractObtained results revealed the following:-5.1.1. y_ egetative growth characteristics:The plants supplied with 30 kg organic-N + 30 kg mineral-N improved plant vegetative growth i.e plant height, leaf area, fresh and dry weight than those received all nitrogen dose (60kg N/fed.) either in the organic or in the mineral forms.Biofertilizer inoculation significantly increased all studied vegetative growth characteristics over the treatments with nobiofertilizer.Spraying plants with Delfan as a source of amino acids gave the highest values regarding plant height, leaf area, fresh and dry weights with a significant increase, followed by garlicextract. Meanwhile, plants with no spray came in the third rank as to their effects on fresh and dry weights.The treatment fertilized with 30kg organic-N + 30kg mineral-N and inoculated with biofertilizer and sprayed with Delfan (amino acids) gave the highest plant growth as compared with all other treatments. Oppositely, using 60kg organic-N without both biofertilizer and without foliar application gave the lowest plant growth i.e., leaf area, fresh and dry weights per plant as compared with all other treatments.5.1.2. Chlorophyll content of leaves:Fertilizer sources (30kg organic-N + 30kg mineral-N, 60 kg mineral-N or 60 kg organic-N) significantly differed from each other in a descending order, with respect to their effect on chlorophyll-A, B and total chlorophyll content.Biofertilizer treatments showed significant increase in chlorophyll A, B and total chlorophyll over the treatments when no bio fertilizers were added.Foliar application with amino acids led to the highest significant increase in chlorophyll-A, B and total chlorophyll content in leaves.The highest chlorophyll-A, B and total chlorophyll content in leaves were obtained by using 30kg N-organic + 30kg N-mineral with biofertilizer and foliar application with amino acids as compared with all other treatments. Furthermore, using 60 kg N-organic without biofertilizer and without foliar application ledto the lowest content of chlorophyllA, B and total chlorophyll in leaves.5.1.3. NPK uptake of leaves, stem and fruits:N-fertilizer sources (30kg organic-N + 30kg mineral-N, 60 kg mineral-N or 60 kg organic-N) significantly differed from each other in a descending order in total NPK uptake.Biofertilizer treatments resulted in the highest significant NPK accumulation in leaves, fruits and consequently total NPK uptake per plant over the treatments when no bio fertilizers were

added.Pepper plants sprayed with amino acids showed the highest NPK accumulation in their stems, leaves, fruits and consequently total NPK uptake per plant with significant increase as compared with other foliar applications.The plants sprayed with amino acids and fertilized with 30kg organic-N + 30kg mineral-N with or without microbin showed the highest total NPK uptake per plant. However, using 60kg organic-N without biofertilizer and without foliar application resulted in the least NPK uptake in leaves, stems, fruits and consequently total NPK uptake per plant as compared with all other treatments.5.1.4. Early and total fruit yield:Plants supplied with 30kg organic-N + 30kg mineral-N produced the highest early and total yield per plant and per feddan, followed by those received 60kg N in the mineral formSUMMARY AND CONCLUSIONwith a significant increase as compared with those received all nitrogen dose (60kg N/fed.) in the organic form.Inoculation with Microbin gave higher early and total yield per plant and per feddan than when no biofertilizer was added.Plants sprayed by Delfan as a source of amino acids produced the highest early and total yield per plant and per feddan with a significant increase as compared with foliar application by garlic extract or without foliar application.The treatment fertilized with 30kg organic-N + 30kg mineral-N and inoculated with microbin biofertilizer and foliar sprayed with Delfan yielded the highest significant early and total yield per plant and per feddan in comparing to all other treatments. This increase reached 37.20 and 16.05 % as an average in both seasons for early and total yield per feddan respectively, as compared with plants supplied with 60 kg mineral-N without biofertilizer or spraying treatments. Moreover, the plants received 30kg organic-N + 30kg mineral-N + biofertilizer without foliar application or with garlic extract came in the second rank. However, adding 60kg organic-N without biofertilizer and without foliar application gave the lowest total yield per plant and per feddan with a significant difference as compared with all treatments.5.1.5. Quality of sweet pepper fruits:5.1.5.1. Fruit physical characteristicsPlants supplied with 30 kg organic-N + 30 kg mineral-N gave larger fruit size and diameter as compared with thatreceived all applied-N in the organic or mineral form at 60 kg N/fed. Data also show that adding all N-requirements (60 kgN/fed.) in the organic form depressed all physical characteristics of fruit quality.Bio fertilizer treatments significantly increased fruit length,diameter, size and average fruit weight over the treatments when no biofertilizers were added.The treatments which sprayed with amino acids gave the largest fruit length and diameter with the heaviest weight.The treatment which received (30kg organic-N + 30kg mineral-N + biofertilizer) with foliar application by amino acids gave heavier fruit weight as compared with all other treatments. However, the treatments which supplied by (60kg organic-N) without biofertilizer and without foliar application gave the leastvalues as compared with all other treatments in most fruit physical traits.5.1.5.2. Fruit chemical constituentsThe plants received 60 kg N as Biogas had the highestsignificant values of vitamin-C and sugars as compared with the other N-sourcesThe highest values of fruit vitamin-C, reducing, non-reducing and total sugars were obtained when inoculation seedswith microbin as compared with the control i.e. without biofertilizer addition.Treatments sprayed with Delfan (amino acids) had high values of acidity, reducing, non-reducing and total sugars contentof fruits with a significant increase as compared with garlic extract or without any application.The highest content of fruit TSS, vitamin-C, reducing and total sugars were obtained by using 60kg organic-N with biofertilizer and foliar application with amino acids as compared with all other treatments, followed by adding 60kg organic-N or 30kg organic-N + 30kg mineral-N with or without biofertilizer addition. However the treatments which supplied by 60kg mineral-N without biofertilizer addition gave the lowest values of fruit chemical constituents; TSS, vitamin-C, reducing andtotal sugars.Nitrate accumulation in fruits was relatively low in plants received 60 kg organic-N, medium in plants fertilized with 30kg mineral-N+30kg organic-N and high in plants supplied with 60kg mineral-N (270.8-279.3 ppm) within all treatments. whereas, NO3-N concentration in sweet pepper fruits is still in the safe border for human consumption.Pepper fruits tissue chemical analysis for Cd (0- 0.06 ppm), Ni (2.1-3.1 ppm) and Pb (0.45-2.29 ppm) in all treatments and in the two seasons ware not exceeded those critical limits.Pepper fruits tissue chemical analysis for Fe (68.197 ppm), Zn (22-36 ppm), Mn (21-30 ppm) and Cu (13.3-19.4 ppm) in all treatments and during two seasons in normal concentrationranges.Conclusion:It could be recommended that inoculating sweet pepper seeds just before seed sowing and transplant roots before transplanting process with the biofertilizer ”Microbin” and supplying developed plants with 30

kg N in the organic form (Biogas manure) + 30 kg N in the mineral form (ammonium sulphate) and sprayed with Delfan (amino acids, 3 ml/e) seven times at 14 days intervals starting 21 days after transplanting, led to the highest vegetative growth, early and total fruit yield as well as the best physical and chemical fruit quality of sweet pepper, cv. California Wonder when grown in clay loam soil.5.2. Second Experiment:"Effect of protecting method, chilling seeds and foliar application treatments with Delfan, sucrose and micronutrients on cold tolerance and productivity of sweet pepper grown at winter season"This experiment aimed to study the effect of treating swollen sweet pepper seeds at low temperature (-1°C) for about 24 h before planting in order to enhance cold tolerance of grown plants during the winter season in the open field compared with planting under low plastic tunnels and foliar application with Delfan (amino acids), micronutrients or sucrose alone or mixed or without foliar application.This experiment included 20 treatments as follows:Protecting method:1.planting in open field2.planting under low plastic tunnels Seeds chilling treatments:1.Without chilling seeds i.e. seeds kept at room temperature (control).2.Chilling of swollen seeds under low temperature (-1° C)for 24 hrs. Foliar spray treatments:1.Without foliar spray (control)2.Foliar spray by amino acids as Delfan3.Foliar spray by sucrose 10%4.Foliar spray by micronutrients (Fe-EDDHA, 60ppm + Zn-EDTA, 30ppm + Mn-EDTA, 30ppm)5.Mixed foliar spray with Delfan + sucrose 10% + micronutrients Fe, Zn and Mn.Obtained results revealed the following:-5.2.1. Vegetative growth characteristics:Planting under low plastic tunnels significantly increased vegetative growth characteristics i.e., plant height, stem diameter, leaf area, fresh and dry weight over the planting in theopen field.Pre-sowing with treatment of seeds low temperature at -1°C for 24 hrs developed plants with significant better vegetativegrowth characteristics i.e., leaf area, fresh and dry weight as compared with unchilled seeds.Mixed foliar application, amino acids or micronutrients significantly differed from each other in a descending order regarding leaf area.The treatment with low temperature treated seeds grown under low plastic tunnels and mixed foliar application gave the highest value of vegetative growth especially leaf area with significant difference as compared with all other treatments.5.2.2. Chlorophyll content of leaves:Planting under low plastic tunnels significantly increased chlorophyll-A, B and total chlorophyll over the treatments in theopen field..Planting with low temperature treated seeds significantly increased chlorophyll-A, B and total chlorophyll over the treatments without chilling.Foliar application with mixed, amino acids or micronutri ents significantly differed from each other in a descending order, with respect to chlorophyll-A, B and totalchlorophyllPlants developed from chilled seeds or not and grown under low plastic tunnels and sprayed with mixed foliar application gave the highest significant chlorophyll-A, B and total chlorophyll content in leaves. Oppositely, the treatments in open field gave the lowest content of chlorophyll-A, B and total chlorophyll in leaves under the afore mentioned conditions.5.2.3. NPK uptake of leaves, stem and fruits:Plants grown under low plastic tunnels gave the highest significant NPK accumulation in leaves, stems, fruits and consequently whole plant over the treatments in the open field.Plants developed from chilled seeds gave the highest significant NPK accumulation in leaves, fruits and whole plant as compared with plants developed from unchilled seeds.Plants sprayed with mixed substances (Delfan, micronutrients and Sucrose) gave the highest significant NPK uptake in fruits and whole plant as compared with other foliarapplications.Pepper plants developed from chilled seeds and grown under low plastic tunnels and foliar sprayed with mixed, amino acids or macronutrients contained the highest significant NPK accumulation in their fruits and consequently the whole plant as compared with either sucrose or unsprayed plants.The treatments in open field and unchilled seeds showed the least NPK accumulation in leaves, stems and whole plant.5.2.4. Flowering and fruit setting:Seeds subjected to low temperature before sowing in the open field gave 100% fruit setting which their plants produced 1-3 flowers per plant during the season and all of these flowers were sited forming fruits. Such plants were late in flower opening time about one week comparing with those grown underlow plastic tunnels.Plants developed under low plastic tunnels in winter grew and flowered well. Meanwhile, sowing swollen seeds without chilling in the open field didn't produce any flowers along bothseasons.The highest significant fruit setting was obtained by the treatment which sprayed with mixed foliar application and low temperature treated seeds under low plastic tunnels compared toother treatments.The earliest significant flower opening time was obtained under low plastic

tunnels by the treatment which sprayed with mixed or amino acids foliar application with low temperature treated seeds or the treatment which sprayed with micronutrients with unchilled seeds compared to other treatments.5.2.5. Early and total fruit yield:During both seasons no fruits from the treatments of open field witL unchilled seeds were recorded. Meanwhile, pepper plants grown in open field using low temperature treated seeds did not produce any early yield, but it produced very low total yield comparing with other treatments. Also, foliar application did not induce any effect on total yield per plant as well as per feddan especially when plants were grown in the open field.Plants developed from seeds subjected to low temperature before sowing and grown under low plastic tunnels and sprayed with mixed substances (Delfan, micronutrients and sucrose) expressed higher early and total yield per plant (g) and per feddan, followed by those sprayed with amino acids ormicronutrients in the same sequence under the previous conditions.5.2.6.Ouality of sweet pepperfruits:5.2.6.1. Fruit physical characteristicsThe treatments under low plastic tunnels significantly increased fruit physical characteristics over the treatments in the open field. Low temperature treated seeds significantly increased fruit physical characteristics over the treatments without chilling.Spraying with mixed foliar application resulted in the heaviest fruit weight as compared with unsprayed control plantswhich came in the last rank.The largest length, diameter and weight of fruits were obtained by the treatment with mixed or amino acids foliar applications with low temperature treated seeds under low plastictunnels.However, the treatments applications was equaled in all i.e. length, diameter, size and chilled seeds or not.5.2.6.2. Fruit chemical constituentsThe treatments under low plastic tunnels produced fruits with the best quality of acidity, T.S.S, vitamin-C, reducing, non-reducing and total sugars with significant increase over thetreatments in the open field.Plants developed from low temperature treated seeds produced fruits with significant better chemical propertiesSUMMARY AND CONCLUSIONwith sucrose or without foliar physical characteristics of fruits weight under low tunnels with(acidity, T.S.S, vitamin-C, reducing, non-reducing and total sugars) as compared with plants developed from unchilled seeds.Pepper plants with mixed, amino acids or sucrose produced fruits with better chemical properties in a descending order as compared with unsprayed control plants which came in the lastrank.Plants with mixed foliar application with chilled seeds or not under low plastic tunnels produced fruits with the best quality (acidity, T.S.S, vitamin C and total sugars) and equal with plants that sprayed with amino acids with chilled seeds or not under low plastic tunnels in acidity and total sugars.The plants which subjected to open field and developed from unchilled seeds did not give any fruits so no recorded dataon it. Conclusion:It could be generally concluded that in winter season, sweet pepper plants responded better when swollen seeds were chilled at -1°C fir 24 hrs before sowing and developed plants were grown under low plastic tunnels and sprayed with mixed foliar application i.e. Delfan (amino acids, 3 ml/() and sucrose (10%) seven times at 14 days intervals starting 21 days after transplanting and micronutrients (60 ppm Fe + 30 ppm Zn + 30 ppm Mn) three times at 21 days interval staring 30 days after transplanting and using drip irrigation system and supplemented with 30kg N in organic form (chicken manure) + 30 kg N in mineral form (ammonium nitrate 33.5 % N) + 64 kg P205 + 96 kg K20/fed. Such treatments induced the best results regardingvegetative growth, early and total yield with the best physical as well as chemical fruit characteristics of sweet pepper cv. California Wonder when grown under winter conditions in clayloam soil.