

ABSTRACT

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Physiological studies on the role of some bio-regulators in growth, flowering and yield of snap bean.

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The aim of this study was to improve growth and productivity of snap bean plants *Phaseolus vulgaris* L. under high temperature stress condition, which can be exposed to it during sowing seeds in delayed date from summer planting through using putrescine at concentrations, i.e., (50, 100, 200 mg/l) and benzyladenine, at (10, 20, 40 mg/l). The experiment also aimed to study the effect of sowing date on growth and productivity of some snap bean cultivars, i.e., Bronco, Paulista, Samantha and Narina grown under Kalubia governorate conditions. The results showed that the combination of sowing seeds on the first of May with foliar spray of putrescine (200 mg/l) or benzyladenine (40 mg/l) diminished the bad effect of sowing on this late time. Bronco cultivar gave the highest yield while, cv. Paulista had positive effect on quality of green pods. The effect of the treatments on bean growth, productivity and morphological parameters as well as chemical constituents of green pods under different sowing dates was discussed.

5- SUMMARY AND CONCLUSION

Two field experiments were carried out during the two successive summer seasons of 2002 and 2003 at the Experimental Farm of the Faculty of Agriculture, Moshtohor, Benha University.

First experiment.

Effect of sowing date on vegetative growth, chemical composition, flowering behaviour and green pod yield and its components of some snap bean cultivars.

This experiment included 12 treatments, which were the combination of 3 sowing dates, i.e., the first of each of March, April and May and four snap bean cultivars namely Paulista, Samantha, Narina and Bronco. A split plot design with four replicates was adopted where the sowing date treatments were distributed in the main plots and cultivars were located in the sub-plots. The obtained results can be summarized as follows:-

1-Vegetative growth characteristics.

- Obtained results refer that vegetative growth aspects, i.e., plant length, number of leaves and branches /plant as well as fresh weight of plant were significantly increased with early sowing on 1st of March, while the dry matter percentage of plant was increased with delaying seed sowing from Marsh 1st to 1st of May.
- There were significant differences among the tested cultivars in all the studied growth measurements. In

- this respect, cv. Bronco reflected the highest values in plant length, number of leaves and branches per plant as well as the fresh weight of plant. On the other hand, cv. Narina exhibited the highest value of dry matter percentage for plant foliage.
- As for the effect of the interaction between that tested sowing dates and cultivars, sowing cv. Bronco on 1st of March gave the highest values in plant length, number of leaves and branches as well as fresh weight per plant. Whereas, sowing the seeds in late planting (1st of May) reflected the highest values of dry matter percentage of plant.

2- Chemical composition of plant foliage.

a- Photosynthetic pigments.

- Early sowing on 1st of March led to significant increases in all assayed photosynthetic pigment (chlorophyll a, b and carotenoids) content in plant leaves.
- Significant differences were detected regarding chlorophyll a, b and total chlorophyll as well as carotenoid content in leaves among the tested cultivars, whereby cv. Paulista followed by both cvs. Bronco and Narina showed the highest values compared with cv. Samantha which induced the lowest values of such photosynthetic pigments.
- The interaction effect between sowing date and the tested cultivars led to a significant increase in all determined photosynthetic pigments. In this regard, cv. Paulista reflected the highest values followed by

cv. Bronco compared with the other used cultivars at all tested sowing dates.

b- Mineral constituents.

- Early sowing of snap bean seeds on 1st of March led to significant increase in total nitrogen, phosphorus and potassium contents in plant foliage compared with either medium (1st of April) or late (1st of May) plantation.
- Significant differences were found in total nitrogen, phosphorus and potassium contents among the tested cultivars, whereby cv. Paulista exhibited the highest values in this respect.
- The interaction effect between sowing date and cultivars indicated that cv. Paulista at the early sowing date showed to the highest N, P and K values.

c- Organic constituents

- It was found that early sowing on 1st of March led to significant increment in reducing, non-reducing and total sugars in plant foliage as well as nucleic acids (RNA& DNA) in plant leaves comparing with late plantations.
- Paulista cultivar reflected the highest values in organic constituents followed in a descending order with cvs. Narina, Bronco and Samantha.
- Sowing seeds of cv. Paulista early on 1st of March produced bean plants contained the highest values of the studied organic constituents as compared with other cultivars and sowing dates.

3- Flowering behaviour

- Early sowing of snap bean seeds on 1st of March significantly increased both number of flowers and pods per plant as well as fruit set percentage. However, late sowing on 1st of May decreased the number of days elapsed from sowing up to anthesis of the first flower.
- Significant differences were found in number of flowers and pods produced per plant as well as fruit setting percentage between the used cultivars.
- Plants of cv. Bronco showed superiority in this respect, followed by those of Paulista, Narina and Samantha. Moreover, plants of cv. Bronco flowered earlier and required the least number of days from sowing till the anthesis of the first flower. While those of cv. Samantha were the latest and those of cvs. Paulista and Narina were in between.
- Early sowing on 1st of March by seeds of cv. Bronco reflected the highest values for number of flowers and pods produced by plant as well as fruit setting percentage. Moreover, it was the earliest cultivar in flowering.

4- Total green pods yield.

- Results insure that sowing the seeds of snap bean in early planting, (1st of March) significantly increased green pods yield per plant as well as feddan compared with medium and late sowing date.

- Results showed significant differences among the used cultivars. In this regard, cv. Bronco produced the highest yield of green pods per plant and feddan, followed by Paulista, Narina, meanwhile cv. Samantha produced the lowest yield.
- Early sowing for cv. Bronco on 1st of March exhibited the highest values for average green pods yield per plant and the total yield per feddan followed by cvs. Paulista and Narina. On the contrary, cv. Samantha reflected the lowest values in all studied yield parameters, especially in case of late sowing (1st of May).

5- Pods quality.

- Results indicated that early sowing on 1st of March improved all the measured physical and chemical parameters for pods, it also increased average pods length, diameter and weight as well as total carbohydrates and proteins content. In the same time, it decreased the crud fiber contents of green pods compared with the late planting either on first of April or May.
- Paulista cv. recorded the highest values in pod length and the highest total carbohydrate and protein content, while cvs. Bronco and Narina recorded the highest values for average pod diameter and pod weight without significant differences between them. Moreover, cv. Samantha recorded the lowest values for crude fibers in produced pods.

-Regarding the interaction effect between sowing date and the studied cultivars, the results showed that planting cv. Paulista on early sowing date (1st of March) recorded the highest values for average pod length, total carbohydrate and protein content of green pods. However, cv. Bronco recorded the highest values for average pod diameter while, cv. Narina produced the highest average pod weight, meanwhile, cv. Samantha recorded the least values in all aforementioned traits, especially on late sowing date (1st of May) .

Conclusion

-It could be concluded that under similar conditions it can be recommended to use Bronco snap bean cultivar on the early sowing (1st of March) to obtain adequate vegetative growth with higher green pods yield. Meanwhile, for better pod quality early sowing and using cv. Paulista could be recommended.

Second experiments.

Effect of sowing date and foliar spray of some bio-regulators on vegetative growth, chemical, composition, flowering behaviour and green pod yield and its components of snap bean cv. Bronco.

This experiment included 21 treatments, which were the combination of 3 sowing dates i.e., first of each of March, April and May and 7 treatments of bio-regulators, namely putrescine at 50, 100 and 200 mg /l and benzyladenine at (10, 20 and 40 mg /l) in addition to the control treatments. Plants were sprayed twice with bio-regulators, 30 days from sowing and 10 days later. A split plot design with four replicates was adopted. Where the sowing date treatments were distributed in main plots and the bio-regulators treatments were randomly arranged in the sub plots. Obtained results can be summarized as follows:-

1-Vegetative growth characters.

- Spraying plants with increasing concentrations of both putrescine (50, 100 or 200 mg /l) or Benzyladenine (10, 20 or 40 mg /l) significantly and gradually increased all the measured growth aspects expressed as plant length, number of leaves and branches as well as fresh weight per plant compared with the check treatment.
- The interaction between the tested sowing dates and bio-regulators, i.e., Put. and BA., led to an increase in all values of growth traits. In this respect, medium concentrations for Put. (100 mg / l) and BA. (20 mg /l) in case of early sowing (1st of March) recorded the highest values, while, the highest concentrations (20 mg/l Put. and 40 mg /l BA) in case of late sowing (1st of May) reflected the highest values of growth parameters.

2-Chemical composition of plant foliage.

a-Photosynthetic pigments.

- Treating the plants with increasing concentrations of bio-regulators either Put. or BA. gradually increased all the determined photosynthetic pigments, i.e., chlorophyll a and b as well as carotenoids. In this respect, 200 mg /l. Put. and 40 mg /l. BA. recorded the highest values.
- The interaction effect between sowing date and bio-regulators indicated that the highest values were recorded in case of using the higher concentration of both bio-regulators on early sowing time (1st of March).

b- Mineral constituents.

- There was gradual increase in total nitrogen, phosphorus and potassium content of plant foliage due to treating plants with increasing concentration of Put. or BA. the highest N P K content was obtained due to using the highest concentrations of Put. (200 mg /l) and BA. (40 mg /l).
- The interaction between sowing date and tested bio-regulators showed that early sowing date on 1st of March and spray the plants with the medium concentrations for Put. (100 mg/l) or BA. (20 mg /l) reflected the highest values in NPK content.

c- Organic constituents.

- Treating the plants with Put. at 100 mg /l or BA. at 40 mg /l increased total sugars content in plant foliage,

- while using the highest used concentration for both Put. (200 mg /l) and BA. (40 mg /l) increased nucleic acid content of plant leaves.
- Spraying plants of the early sowing date (1st of March) with medium concentration of Put. (100 mg /l) or BA. (20 mg /l) showed superiority regarding all sugar fractions. While as using the highest concentration for both bio-regulators, especially in case of late sowing date (1st of May) recorded the highest values for sugars as well as nucleic acid content in bean plants.

3- Flowering behaviour.

- Treating plants with bio-regulators resulted in significant increases in number of flowers, number of pods per plant and fruit setting percentage. However, no significant effects were noticed in number of days elapsed from sowing to the first flower anthesis as compared with check treatment.
- Spraying bean plants with the highest level of Put. (200 mg/l) or BA. (40 mg/l) was able to ameliorate the depressive effects of delayed sowing dates, especially on 1st of May regarding flowering behaviour of plants.

4- Yield of green pods.

- Results insured that using both bio-regulators at medium or higher rates significantly increased the produced yield either for plant or per fed. in comparison with the check treatment and the lower tested concentration with a limited preference to wards puterscine.
- The interaction effect for both sowing date and bio-regulators significantly increased all recorded yield

parameters. In case of sowing bean seeds early on 1st of March it proved to be enough use the medium levels of the tested bio-regulators. However, it is advisable to use the highest concentrations of Put. (200 mg/l) or BA. (40 mg/l) in order to ameliorate the despressing effect of late sowing date (1st of May) on yield productivity).

5- Pod quality.

- Using bio-regulators at different studied concentrations led to an increase in physical pods parameters (pod length, diameter and weight) and chemical constituents (total carbohydrate and proteins contents). On the other hand, it decreased the crude fibers content of produced pods. In this respect, the highest used concentration was the best one.

-Early sowing combined with treating plants with medium concentration for both Put. (100 mg / l) and BA. (20 mg / l) recorded the best results. Moreover, bio-regulators at the highest used concentration (200 mg / l Put. and 40 mg /l) BA. recorded the best results under late sowing conditions.

Conclusion

It could be concluded that under such conditions of the experiment early sowing on 1st of March and treating the plants of cv. Bronco twice with 100 mg / l Put. or 20 mg /l BA. were recommended for sowing snap bean cv. Bronco and obtaining good vegetative growth with higher green pods yield and best quality. However, it is advisable to use the highest concentration of Put. (200 mg/l) or BA.(40 mg /l) in order to ameliorate the