International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
www.chemijournal.com
IJCS 2020; 8(2): 1166-1168

Received: 20-01-2020
Accepted: 24-02-2020

Abhay Kumar Yadav
C.S. Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh, India

JP Singh
C.S. Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh, India

Harendra Pratap Singh Choudhri
University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh, India

Suneel Kumar Patel
C.S. Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh, India

Prabhakar Yadav
Faculty of Agriculture Sciences and Allied Industries Rama University, Kanpur, Uttar Pradesh, India

Corresponding Author:
Abhay Kumar Yadav
C.S. Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh, India

Effects of foliar application of boron and gibberellic acid on seed index and yield of phalsa (*Grewia asiatica* L.)

Abhay Kumar Yadav, JP Singh, Harendra Pratap Singh Choudhri, Suneel Kumar Patel and Prabhakar Yadav

DOI: https://doi.org/10.22271/chemi.2020.v8.i2r.8927

Abstract
The present experiment entitled "Effects of Foliar Application of Boron and Gibbrelic Acid on seed index and yield of Phalsa (*Grewia asiatica* L.)" was conducted at Garden, College of Horticulture, Department of Fruit Science, Chandra Shekhar Azad University of Agriculture and Technology Kanpur, Uttar Pradesh in the year 2018-2019. It was carried out in randomized block design with 10 treatments and each treatment replicated thrice. The results of this study on the effect of Boron level from 20-50 ppm and GA_3 30 ppm (with and without) foliar spray on Phalsa of growth regulators boron (Bo) and GA_3 were discussed and interpreted in the light of previous research in India and abroad. The study showed significant findings and concluded that T_9 (40 ppm boron+30ppm GA_3) resulted as the maximum seed index (59.82 g) and fruit yield per plant (6.01 kg) and per hectare (82.57 q) was maximum.

Keywords: Boron, gibbrelic acid, phalsa seed index, yield, significant

Introduction
Phalsa (*Grewia subinaequalis* D.C.), which is also known as star apple is a subtropical fruit of India. It belongs to the family "*Tiliaceae*". This family have about 41 genera and 400 species which are mostly distributed in the tropical and subtropical region of the world. Among various fruits grown in the country, minor fruits in spite of high nutritive content and health benefits have not received much attention with respect to value addition because of low yield and lack of improved cultivars.

Phalsa fruit is ready for picking in the south from March to April and in north, from May to June. Phalsa is being a hardy plant, can withstand drought and can be grown under adverse climatic condition Phalsa fruit is ready for picking in the south from March to April and in north, from May to June. Phalsa is being a hardy plant, can withstand drought and can be grown under adverse climatic condition Phalsa fruit are small and born in profusely. They do not ripen with a definite spell of time and thus become a problem to grower

Ripe fruit are good source of vitamin A and vitamin C. They are also fair source of phosphorous and iron. The fruits are highly perishable in nature and due to its perishability, it cannot be exported but its processed products are very appreciable. Ripe fruits are consumed fresh in desserts, or processed into refreshing soft drinks like squash, RTS, sharbat etc. which are enjoyed during hot summer months in India. The attractive crimson red to dark purple colour of phalsa fruit is due to anthocyanin pigments mainly, delphinidin-3-glucoside, cyanidin-3-glucoside and pelargonidin-3, 5 diglucoside (Tiwari *et al.*, 2014) [5]. The fruits are used in processing industry for making excellent juice and squash and also as table fruit, since it has sub-acidic taste. The fruit are also possessing high medicinal properties. Its ripe fruit exert cooling effect, cure inflammation, heart disease, fever and constipation.

Keeping in view of there need to work out the effective dose of boron on seed index and yield attributes of phalsa, the present experiment was undertaken with following objectives:

1. To study the effect of foliar application of boron and GA_3 on seed index.
2. To study the effect of foliar application of boron and GA_3 on yield per plant.
3. To study the effect of foliar application of boron and GA_3 on yield per hectare of phalsa.

Material and Method

The experiment was conducted in the Garden, Department of Horticulture, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur (Uttar Pradesh) during the year 2018-2019. The effect of foliar application of boron on plant growth, flowering and yield of Phalsa (*Grewia asiatica* L) was carried out under Kanpur agro climatic conditions at the research farm. As the fruits are born on new growth regulators therefore application of fertilizer is essential to encourages vegetative growth. Recommended dose of N, P & K was applied to get proper growth and higher yield of better quality fruits. Well established thirty plants of phalsa cv. Sharbati were taken for the present experiment and uniform cultural practices were done timely. Healthy bushes of phalsa were pruned to a height of 60 cm from the ground level on 25 December during 2018-2019. The data obtained on each aspect on each treatment were statistically computed in factorial RBD design with 10 treatments and each treatment thrice replicated by which making the total number of 30 plant and their spacing row to row 3×3 m and plant to plant 2.5×2.5 m. The observations regarding seed index yield per plant and yield per hectare of phalsa plant were recorded. Statistical analyses of the data obtained in the different sets of experiments were calculated as suggested by Panse and Sukhatme and results were evaluated at 5% significance.

Table 1: Treatment and their contribution for experiment

S. No.	Treatment Symbol	Treatment Contribution
1.	T_1	Control (water spray)
2.	T_2	Boron 20 ppm
3.	T_3	Boron 30 ppm
4.	T_4	Boron 40 ppm
5.	T_5	Boron 50 ppm
6.	T_6	GA_3 30 ppm
7.	T_7	Boron 20 ppm + $GA_3$30 ppm
8.	T_8	Boron 30 ppm + $GA_3$30 ppm
9.	T_9	Boron 40 ppm + $GA_3$30 ppm
10.	T_{10}	Boron 50 ppm + $GA_3$30 ppm

Result and Discussion

The findings of the present study as well as relevant discussion have been presented under following heads:

1. Seed Index

The foliar nutrition of boron with and without GA_3 significantly influenced the test weight of phalsa fruit during the experimental year. The data obtained were statistically analysis. The mean values were summarised and displayed in table-2. In this regard, the maximum test weight 59.82g was expressed in the plants which was treated under coupled treatment of boron 40 ppm+GA_3 30 ppm (T_9) followed by treatment of T_{10} (boron 50 ppm + GA_3 30 ppm) revealing 59.46g weight against the untreated plants (control) which were revealed 51.43 g test weight being significant lesser during the experimentation followed by treatment T_2 (52.16 g). Treatments T_3, T_4, T_6 and T_7 presenting 52.94, 54.31, 64.67 and 55.16 g test weight of phalsa respectively, these treatments exhibited at par values when compared with control, as well as when compared among one another same trend was observed, whereas, remained all other treatments showed significant variation when compared with control. Treatments of T_5 and T_8 were exhibited 55.78 and 56.98 g test weight when compared in between found to be non-significant, whereas, when compared with control varied significantly.

Table 2: Effect of foliar nutrition of boron with and without GA_3 on seed index of phalsa fruit (g)

Symbol	Treatments	weight of 100 fruits (g)
T_1	Control (water spray)	51.43
T_2	Boron 20 ppm	52.16
T_3	Boron 30 ppm	52.94
T_4	Boron 40 ppm	54.31
T_5	Boron 50 ppm	55.78
T_6	GA_3 30 ppm	54.67
T_7	Boron 20 ppm+GA_3 30 ppm	55.16
T_8	Boron 30 ppm+GA_3 30 ppm	56.98
T_9	Boron 40 ppm+GA_3 30 ppm	59.82
T_{10}	Boron 50 ppm+GA_3 30 ppm	59.46
	S.E. Difference	1.938
	C.D. @ 5%	4.07

3. Yield per plant of phalsa (kg/plant)

Yield per plant of phalsa was profoundly and consistently influenced by different levels of micronutrient boron, GA_3 30 ppm and coupled treatment of boron with GA_3 30 ppm. The data obtained were subjected to statistically analysis. The mean values summarised and displayed in table-3. The plants which were treated with coupled treatment of Boron 40 ppm+GA_3 30 ppm (T_9) produced significantly maximum (6.01 kg) fruit per plant of phalsa closely followed by treatment of Boron 50 ppm + GA_3 30 ppm (T_{10}) expressed (5.93 kg) fruits per plant against untreated plant i.e. control produced significantly lesser 3.92 kg fruits per plant. Remaining treatments T_2 (boron 20 ppm), T_3 (boron 30 ppm), T_4 (boron 40 ppm), T_5 (boron 50 ppm), T_6 (GA_3 30 ppm), T_7 (boron 20 ppm+ GA_3 30ppm) and T_8 (boron 30 ppm+ GA_3 30 ppm) presenting 4.21, 4.72, 5.00, 5.51, 5.02, 5.21 and 5.53 kg fruit/plant respectively, among these treatments when compared one another did not bring significant variation barring treatment of T_2 and T_3 producing 4.21 and 4.72 kg fruits/plant respectively. As well as all the treatments were exhibited significantly greater in fruit production of phalsa when compared with control (3.92 kg) barring the treatment of boron 20 ppm (T_2) which produced 4.21 kg fruits/plant during investigation.

Table 3: Effect of foliar nutrition of boron with and without GA_3 on yield/plant of phalsa (kg)

Symbol	Treatments	yield/plant of phalsa (kg)
T_1	Control (water spray)	3.92
T_2	Boron 20 ppm	4.21
T_3	Boron 30 ppm	4.72
T_4	Boron 40 ppm	5.00
T_5	Boron 50 ppm	5.51
T_6	GA_3 30 ppm	5.02
T_7	Boron 20 ppm+GA_3 30 ppm	5.21
T_8	Boron 30 ppm+GA_3 30 ppm	5.53
T_9	Boron 40 ppm+GA_3 30 ppm	6.01
T_{10}	Boron 50 ppm+GA_3 30 ppm	5.93
	S.E. Difference	0.33
	C.D. @ 5%	0.70

4. Yield / hectare of phalsa (q/ha)

After final picking, yield obtained at different harvest were summed up and yield per hectare was calculated during the experimental period. Data thus, obtained were subjected to statistically analysis. The mean values summarised and presented in table-4. It is apparently clear from mean values that yield of phalsa fruit/ha varied significantly. Application of coupled treatment of boron 40 ppm+GA_3 30 ppm (T_9) produced significantly greater yield i.e. 82.57 q/ha closely

followed by coupled treatment of Boron 50 ppm+GA_3 30 ppm (T_{10}) produced 81.26 q/ha. Untreated plants i.e. controls revealed the minimum 54.05 q/ha yield being significant during investigation. Remaining treatments i.e. boron 20 ppm (T_2), boron 30 ppm (T_3), boron 40 ppm (T_4), boron 50 ppm (T_5), GA_3 30 ppm (T_6), boron 20 ppm + GA_3 30 ppm(T_7) and boron 30 ppm + GA_3 30 ppm (T_8) producing 58.05, 65.08, 68.95, 75.98, 69.22, 71.84 and 76.25 quintal yield per hectare respectively. When a deep vision focused on mean values it was found that treatment of T_5 and T_8 did not bring significant influences, whereas treatment T_6 and T_7 when compared in between exhibited significant variation, as well as treatment of T_2, T_3, and T_4 when compared among themselves expressed significant variation. Similarly treatments of T_5, T_6 and T_7 when compared among them there were also found to be significant differences.

Table 4: Effect of foliar nutrition of boron with and without GA_3 on yield/ha of phalsa (q/ha)

Symbol	Treatments	yield/ha of phalsa (q)
T_1	Control (water spray)	54.05
T_2	Boron 20 ppm	58.05
T_3	Boron 30 ppm	65.08
T_4	Boron 40 ppm	68.95
T_5	Boron 50 ppm	75.98
T_6	GA_3 30 ppm	69.22
T_7	Boron 20 ppm+GA_3 30 ppm	71.84
T_8	Boron 30 ppm+GA_3 30 ppm	76.25
T_9	Boron 40 ppm+GA_3 30 ppm	82.57
T_{10}	Boron 50 ppm+GA_3 30 ppm	81.26
	S.E. Difference	0.65
	C.D. @ 5%	1.94

Conclusion

On the basis of summary of results treatment of boron 40 ppm coupled with GA_3 30 ppm (T_9) increases the seed index, yield per plant and per hectare of phalsa fruit. Other treatment of different level of boron, GA_3 30 ppm as well as remained couple treatments of boron with GA_3 also improved above parameters though, the maximum attributor characters including yield were enhanced by the coupled treatment of boron 40 ppm with GA_3 30 ppm. So it is advice to orchardist, grower and research workers to spraying of boron 40 ppm + GA_3 30 ppm for improving seed index and yield for enhancing economy and prosperity of phalsa growing region and country.

Reference

1. Ali M, Ahmad M, Anjam N, Rehman H Ur, Kasana MI, Tariq S *et al*. Efficacy of boron and gibberellic acid on growth and fruit yield in olive (*Olea europaea* L.) cv. Gemlike. International Journal of Biotechecnology, 2014; 11(2-3):295-298.
2. Jitendra, Saravanan S, Kasera S, Lal D, Singh VK. Effect of Foliar Spray of Micro Nutrients on Plant Growth, Yield and Fruit Quality of Phalsa (*Grewia asiatica* L.). Environment & Ecology. 2017; 35(4A):2841-2845.
3. Kacha HL, Viradia RR, Leua HN, Jat G, Tank AK. Effect of NAA, GA_3 and ethereal on yield and quality of phalsa (*Grewia asiatica* L.) Asian J Hort. 2012; 7(2):242-245.
4. Panse VG, Sukhatme PV. Statistical methods for agriculture workers. Indian Council of Agricultural Research, New Delhi. 1985; 2:197.
5. Tiwari DK, Singh D, Barman K, Patel VB. Bioactive compounds and processed products of phalsa (*Grewia subinaequalis* L.) fruit. Popular Kheti. 2014; 2(4).
6. Trivedi N, Singh D, Bahadur V, Prasad VM, Collis JP. Effect of foliar application of zinc and boron on yield and fruit quality of guava (*Psidium guajava* L.). Hort Flora Research Spectrum. 2012; 1(3):281-283.
7. Zeeshan Mohd, Singh JP. Studies on effect of foliar application of boron and GA_3 on growth fruiting and yield of phalsa (*Grewia subinaequalis* D.C.). Hort Flora research Spectrum. 2017; 6(4):273-277.
8. Zeeshan Mohd, Singh JP. Studies on foliar application of boron and GA_3 on physico-chemical composition and yield of phalsa (*Grewia subinaequalis* D.C.). Hort Flora Research Spectrum. 2018; 7(1):52-57.