



Foliar Application of Boron and Calcium Nitrate Decreased Fruit Cracking and Improved Quality in Pomegranate (*Punica granatum* L.)

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ABSTRACT

A field study was carried out to determine the effect of calcium nitrate and boron on yield and fruit cracking of Pomegranate cv. Sindhuri (Bhagwa). Different treatments were T1-Farmers' practice, T2-recommended dose of fertilizers as per package of practices (FYM 25 kg per plant + NPK 625: 250: 250g per plant and micro nutrient 25 g per plant) with (Micronutrient) multi-mix at the rate 25g per plant per year in the month of July –August (Basel dose of Manure & fertilizer), T3- RDF and the foliar spraying at different growth stages (Calcium (CaNa₂) @ 0.2 per cent and Boron as borex @ 0.3 per cent) at the time of full blossoming and one month after full blossoming (developing stage of fruit). The results of the study revealed significant improvements in both yield and quality of pomegranate. However, calcium (CaNa₂) @ 0.2 per cent and boron as boric acid @ 0.3 per cent proved to be the best treatment over other treatments. Furthermore, an average enhancement of yield to the tune of 29.26 per cent and quality in terms of "A" grade pomegranate followed by a reduction in fruit cracking to the tune of 3.74 per cent were achieved over control. Thus, it can be concluded that foliar sprays of calcium nitrate and boron on pomegranate not only reduces fruit cracking but improve yield and quality and thus resulted in significantly higher economic returns.

Key Words:

INTRODUCTION

Pomegranate (*Punica granatum* L.) belonging to the family Punicaceae is one of the most favorable fruits of tropical and sub-tropical regions. The fruit is a native of Iran and is extensively cultivated in Mediterranean countries, for its sweet acidic fruits, which provide a cool refreshing juice and it is valued for its medicinal and nutritional properties. The fruit is also processed to make juice, syrup, jam, jelly, wine and to flavor cakes, baked apples, etc. In India, commercial plantations of pomegranate exist in Maharashtra, Gujarat, Rajasthan, and Karnataka owing to its preference for arid and semi-arid climate. Due to its xerophytic characteristics and hardy nature it is suitable crop for dry, rainfed, pasture and undulating land. India occupies the first position in the world with respect to area and production of pomegranate but the

productivity is very low (6.57t/ha) compared to other important pomegranate growing countries (18.5t/ha) of the world (Ram Chandra *et al*, 2011). At present Maharashtra is leading in pomegranate cultivation which accounts for 78% of the total area under cultivation in India (Sharma *et al*, 2014). However, its cultivation is gaining momentum in arid districts of Rajasthan with the production of 1.14 million tonnes from 132,000 ha area (Sharma *et al*, 2014). Pomegranate is becoming preferred cash crop among the farmers of arid districts of Rajasthan due to high yield potential, excellent quality and higher economic net return. However, cracking of pomegranate fruit, a general problem throughout its growing areas and among all varieties is more in arid region and it is as high as up to 65% (Prasad *et al*, 2003). The possible

reason of higher incidence of fruit cracking in arid region might be very high evapotranspiration, low humidity, water imbalance and sharp temperature fluctuation in day and night during fruit growth and development (Abd and Rahman, 2010). This coupled with improper irrigation, environmental factors and nutritional deficiency, especially boron, and calcium aggravates the situation. The cracking is more evident when the fruits are at maturity stage.

MATERIALS AND METHODS

The experiment was conducted on 4-5 yr old bearing trees of Pomegranate cultivar Bhagwa planted during 2016 and 2017 at Barmer and Sheo blocks of Barmer district. The experiment was conducted during 2019-20 for assessing the effect of foliar application of micronutrient mixtures such as boron and calcium nitrate in pomegranate for reducing fruit cracking and yield enhancement. The experiment was replicated at ten farmer's field. Different treatments were T1-Farmers' practice, T2-recommended dose of fertilizers as per package of practices (FYM 25 kg per plant + NPK 625: 250: 250g per plant and micro nutrient 25 g per plant) with (Micronutrient) multi-mix at the rate 25g per plant per year in the month of July –August (Basel dose of Manure & fertilizer), T3- RDF and the foliar spraying at different growth stages (Calcium (CaNa₂) @ 0.2 per cent and Boron as borex @ 0.3 per cent) at the time of full blossoming and one month after full blossoming (developing stage of fruit). Farmers were trained for the foliar application of boron and calcium Nitrate in Pomegranate. 4-5 yr old plant of Pomegranate variety Bhagwa/ (Sindhuri) was used for experimental purpose. Plant spacing maintained was 4 m x 3 m (row to row and plant to plant). Different biometric and yield quality parameters (Number of fruit /plant, Number of cracked fruit, average fruit weight, and Yield per plant) were recorded during the study period.

RESULTS AND DISCUSSION

Fruit yield and quality parameters

The data pertaining to the effect of foliar

application of micro nutrient like borex and calcium nitrate on fruit yield and quality parameters revealed significantly higher number of fruit per plant (46.24), fruit weight (190.92gm) and fruit yield per plant (8.82 kg) and yield (73.45 q/ ha) with the foliar application of borax @ 0.3 % + calcium Nitrate @ 0.2 % (T3) at the time of full blossoming and one month after full blossoming and statistical at par with T2. However, lowest number of fruit per plant (38.52), fruit weight (177.00 g) and fruit yield per plant (6.82kg) and yield (54.70 q/ ha) under farmers' practice. Minimum fruit cracking (19.99 %) with foliar application of borex and calcium nitrate (T3) and highest fruit cracking (23.73 %) was found under the farmers' practices (T1).

The increase in fruit yield with the foliar application of borex and calcium nitrate (Micro Nutrients) may be attributed to increased number of fruits, fruit weight and minimum fruit cracking. It may be due to improved physico-chemical quality of fruits. The reduction in fruit cracking may be attributed to the physiological role of borex in the synthesis of pectic substances in the cell wall, which strengthened the tissues and prevented fruit cracking. Role of calcium in binding the tissues especially in the middle lamella play an important role in reducing the fruit cracking. This can also be attributed to a synergism of borex that may help in calcium metabolism in cell wall, elongation and cell division. Similar findings were reported by Sharma *et al* (2020), Korkmaz N *et al* (2015;2016), Khurshid *et al* (2019) Goargiuos K G (2016) and Sheikh and Manjula (2012).

Economics of fruit cracking in pomegranate

The data (Table 3) revealed treatment (T3) RDF + Spray of Borex 0.3% and calcium nitrate 0.2% foliar spray fetched significantly highest net return and B:C ratio (Rs. 2,92,488 /ha and 3.75) followed by (T2) Recommended dose of fertilizer and micro nutrient spray treatment. The lowest B:C ratio was observed under farmers' practice (T1). In the present study B:C ratio of 3.09 was recorded under control (Farmers' practice) hence this ratio can be

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Table 2. Effect of borex and calcium nitrate on fruit yield and quality of pomegranate.

Treatment	No. of fruit per plant			Fruit weight (g)			Fruit cracking (%)			Fruit yield (kg/plant)		
	2019	2020	Av.	2019	2020	Av.	2019	2020	Av.	2019	2020	Av.
T1	39.91	37.12	38.52	175.4	178.6	177.00	31.21	16.25	23.73	7.00	6.63	6.82
T2	40.23	38.50	39.37	183.2	181.3	182.25	29.38	15.30	22.34	7.37	6.98	7.18
T3	48.98	43.49	46.24	190.3	191.14	190.72	21.36	18.61	19.99	9.32	8.31	8.82

improved by the use of borex and calcium nitrate. Similar findings were reported by Khurshid *et al* (2019), Sheikh and Manjula (2012).

CONCLUSION

Plant nutrients especially borex and calcium play an important role in growth, fruit retention and development and cause efficient yield quality improvement and net return. Results revealed that foliar spraying borax, calcium in pomegranate plant at the time of full blossoming and one month after full blossoming. The foliar application Borax 0.3% + Calcium nitrate 0.2% with RDF was found most suitable for getting maximum fruit, fruit yield and fruit quality as well as net return followed by RDF at marvel stage of fruits were effective in enhancing fruit yield, quality parameters and net return of pomegranate. So, there is need to disseminate the improved technologies of pomegranate among the farmers with effective extension methods like front line demonstration.

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Table 3. Effect of borex and calcium nitrate on yield and economic analysis.

Treatment	Yield (q/ha)			Increase in Yield (%)			Net Return			B:C Ratio		
	2019	2020	Av.	2019	2020	Av.	2019	2020	Pooled	2019	2020	Av.
T1	58.31	55.24	54.70	-	-	-	157437	236886	197162	2.83	3.34	3.09
T2	61.38	58.13	59.75	5.26	5.23	5.25	165726	249280	207503	2.98	3.51	3.25
T3	77.65	69.25	73.45	33.17	25.34	29.26	271775	313200	292488	3.43	4.06	3.75

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