

Studies on effect of interval of basin watering in ber cv. Banarasi Karka through farmers' acceptable approach

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ABSTRACT

An investigation was made to find out the effect of interval of watering on control of fruit drop and to improve the yield in ber cv. Banarasi Karka cultivar of ber grown in laterite soil. There were six treatments which included as application of basin watering @ 60 litres/plant, applied at 15, 20, 25, 30 days (at two different dates) interval and no watering (control). Tree basin was mulched with grasses in all the treatments including control. The result of two years of investigation revealed that basin watering @ 60 liters /plant at 20 days interval started from 20th October and continued upto 5th January resulted in highest fruit retention (42%) which consequently resulted in highest fruit yield of 14.6 kg/plant as against 6.2 kg⁻¹/plant in control. Maximum in fruit weight, pulp percentage and ascorbic acid content in fruit were also significantly noted from plants, watered at 20 days interval.

Key Words: Ber, fruit production, laterite soil, water requirement

In the western part of West Bengal which comprises the districts of Bankura, Purulia, Birbhum, Paschim Medinipur and part of Burdwan where the soil is red and laterite, porous, acidic in nature, low in organic matter and nutrients and annual precipitation is varied between 1100-1500 mm. In this part (called as red and laterite zone), ber has been performing well in terms of quantity as well as quality. Among the several varieties tested 'Banarasi Karka' which is known as 'Narkeli Kul', is very popular and has wide acceptability due to its sweet taste with pleasant aroma and having higher pulp content. (Ghosh *et al.*, 2009) This cultivar put forth flowering and fruiting in September and is harvested in January-February. During this long period, the plant experiences soil moisture stress which may accelerate the fruit dropping (Ghosh and Tarai, 2007). Although, other factors like hormonal imbalances (Bal *et al.*, 1988), nutritional deficiencies (Chauhan and Gupta, 1985), etc. was also responsible for fruit dropping. Water availability in the red and laterite zone during off-monsoon is one of the limiting factors for providing irrigation to the fruit crops. The costly ground water need to be utilized effectively towards fruit production. Although irrigation through drip is considered as most effective, efficient and economical but this system requires initial high investment and power supply which may not be possible for the marginal or poor farmers/growers. Basin watering by manual method from nearby dug well/pond is considered as most practical approach in West Bengal and others Eastern states like Bihar, Orissa, Jharkhand,

Assam, etc., for the marginal farmers/growers. But any type of research data on watering in ber in West Bengal or other areas is not available. With view to find out the effective requirement of interval of watering and also to quantify the water to be required by a plant after fruit set during off-monsoon, an investigation was, therefore, made in this direction.

MATERIALS AND METHODS

The experiment was conducted in a private orchard at Jhargram, Paschim Medinipur, West Bengal during 2008-09 and 2009-10 on 8 year old Banarasi Karka cultivar of ber which was planted at the spacing of 3.5 × 4.5 m (plant to plant). The experiment was laid out in Randomized Block Design with four replications having two plants per replication. There was six treatments *viz.*, basin watering @ 60 liters/plant, applied at the interval of 15, 20, 25 and two different dates of 30 days and control (no watering). In all the treatments, the plant basin was mulched with green grasses. The first watering was given in all the treatments except control was on 20th October. In case of 15 days interval, the last watering was made on 5th January and thereby the plant received 6 times irrigation with 360 litres of water/plant; for 20 days interval, last watering was 10th January and the plant received 5 times irrigation with 300 litres of water; for 25 days interval, the last irrigation was 10 January and the plant received 4 times irrigation with 240 litres of water. In case of 30 days interval of watering, the last irrigation in one case was 20th December and the plant received 3 times irrigation with 180 litres of water and in another case, the last irrigation was 20th November

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Table 1: Effect of watering on fruit retention, yield and physico-chemical characteristics of ber cv. Banarasi Karka (pooled of two years)

Treatments	No. of irrigation plant ⁻¹	Quantity of water plant ⁻¹ (Litre)	Fruits retention (%)	Yield plant ⁻¹ (Kg)	Fruit weight (g)	Pulp (%)	TSS (^o B)	Acidity (%)	Total sugar (%)	Ascorbic acid (mg/100 g pulp)
15 days interval	6	360	22 (27.97)	7.5	21.5	95.5	15.0	0.27	9.2	130
20 days interval	5	300	42 (40.40)	14.6	24.5	96.5	15.8	0.25	9.8	136
25 days interval	4	240	36 (36.87)	8.6	21.8	95.4	15.6	0.22	9.7	134
30 days interval	3	180	38 (38.06)	10.5	26.2	96.0	15.9	0.23	11.1	137
30 days interval	2	120	26 (30.66)	8.2	22.1	94.5	15.8	0.27	10.9	132
No watering	0	0	20 (26.57)	6.2	20.0	94.0	15.5	0.27	11.2	131
LSD(0.05)	-	-	1.8	1.9	1.6	1.8	N.S.	N.S.	N.S.	1.4

Note: Figures in the brackets are Angular transformed values, Mulching used in all treatments.

Table 2: Economics of watering on fruit production in ber

Treatments	No. of watering	Expenditure (Rs ha ⁻¹)	Yield plant ⁻¹ (Kg)	Yield (Kg ha ⁻¹)	Value (Rs ha ⁻¹)	Net income (Rs ha ⁻¹)	Net income over control (Rs ha ⁻¹)
15 days interval	6	14,400	7.5	4755	47,550	33,150	(-) 6,160
20 days interval	5	12,000	14.6	9256	92,560	80,560	(+) 41,250
25 days interval	4	9600	8.6	5452	54,520	44,920	(+)5,610
30 days interval	3	7200	10.5	6657	66,570	59,370	(+) 20,060
30 days interval	2	4800	8.2	5199	51,990	47,190	(+) 7,880
No watering	0	0	6.2	3931	39,310	39,310	-

No. of plants ha⁻¹ = 634

and plant received 2 times irrigation with 120 litres of water during the fruiting season. The plants were fertilized every year with 30 kg Farm Yard Manure, 300 g N, 100 g P₂O₅ and 200 g K₂O/plant in two splits i.e. in May and September. Two to three prophylactic sprays were followed against insect pest and diseases. For recording fruit retention, 100 setted fruits in each plant were tagged on 20th October i.e. on the date of first watering and it was calculated on the basis of number of fruits retained on 20th January and expressed in percentage. The fruit yield was calculated on the basis of actual weight of mature fruits harvested from each plant. For fruit weight, 100 fruits were taken from each plant and average weight was calculated. For calculating fruit pulp recovery percentage, 20 fruits /plant was weighted, peeled and recovery of pulp thus calculated. The TSS was measured by hand refractometer while acidity, total sugar and ascorbic acid content of fruits were determined by following standard method (A.O.A.C., 1990). Economics of the treatments was calculated on the basis of 634 plants

/hectare and cost of mandays was considered as Rs. 150/- per manday. One man had the ability to irrigate 40 plants in a day and thus cost of the watering was calculated. The salable rate of ber fruits was considered as Rs. 10/- per kg.

RESULTS AND DISCUSSION

The results of two years of investigation revealed that watering had the beneficial role in enhancing fruit retention in ber and basin watering at 20 days interval was the most effective which resulted in 42% retention of fruits as against 20% in control. Watering at 30 days interval during the period 20th October and 20th December was the 2nd most effective treatment which resulted in 38% retention of fruits. One interesting observation was the watering at 15 days interval i.e., providing maximum watering of 360 liters /plant was the least effective in enhancing the fruit retention. Again, watering during December is the most vital when we compared the time of watering between two dates of 30 days of watering interval. Mishra (2011) also

advocated ber plants to be irrigated at 30 days interval from November to February for getting higher yield.

Due to maximum fruit retention in the plants of watered at 20 days interval, the yield was also highest in this case (14.6 kg yield/plant). The 2nd highest yield (10.5 kg/plant) was recorded from the plants, received watering at 30 days interval during the period 20th October and 20th December. The higher yield in the plants, received water at 20 days or 30 days interval may be explained from the fact that water helps to mobilize the nutrients from the soil to plants and also it played a vital role for maintaining the ongoing physiological process in the plants that helps to retain more number of fruits and also to increase the size of the fruits and ultimately resulted in enhancement of fruit yield. The maximum yield in the plants, watered at 20 days interval may be attributed to its timely fulfillment of its requirement in this particular agro-climatic zone for maintaining the ongoing physiological processes in the plants. The lowest yield was recorded from the control plant (6.2 kg/plant) which may be due to least retention of fruits.

Fruit weight was significantly improved due to watering and highest weight able fruit was recorded from the plants received 3 times watering at 30 days interval (26.2 g) closely followed by 5 times watering at 20 days interval (24.5 g) and lowest fruit weight was noted from the control plants (20.0 g). The pulp percentage was also significantly improved due to watering and maximum pulp recovery percentage was recorded from the plants received watering at 20 days interval (96.5%) and minimum in control (94.0%). The total soluble solids, acidity and total sugar were not significantly varied due to different watering intervals. However, ascorbic acid content was significantly higher in the fruits of the plants received water 5 times at 20 days interval and 3 times at 30 days interval (136-137 mg/100 g pulp) and lowest in control (131 mg/100 g pulp).

Economic feasibility of the experiment has been presented in Table 2. In close spacing of 3.5 m X 4.5 m, 634 plants could be accommodated in one hectare of land. Watering the ber plants at 15 days interval i.e., 6 times watering during the period 20th October and 5th January calculated as involvement of highest expenditure of 14,400/- with lowest income of Rs.33,150/- per ha. Watering at 20 days interval resulted in highest yield which consequently gave highest net income of Rs.80,560/- with an extra income of Rs. 41, 250/- per ha over control (No irrigation).

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