

Original Research Article

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## Study on Economics of Peach Cultivation under Different Fertigation Level and Foliar Applications in *Tarai* region of Uttarakhand, India

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### ABSTRACT

#### Keywords

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The present study was carried out at Horticultural Research Centre, Patharchatta, G.B. Pant University of Agriculture and Technology Pantnagar, Uttarakhand to find out the most effective combination of NPK fertigation with foliar applications on economic performance of peach during two successive years *i.e.*, 2015 and 2016 in five and six years old peach cv. Shan-e-Punjab. Based on recommended dose of fertilizer (420:240:300g NPK/tree/year) for conventional method, nine treatments were formulated and studied. The obtained results indicate that the maximum yield (10.61 t/ha) was recorded with T<sub>8</sub>. Similarly, the total expenditure cost (Rs. 107530.31), gross income (Rs. 530500.00) and net income (Rs. 422969.69) per hectare were found higher under treatments T<sub>8</sub>, whereas, it was found to be lowest under control (T<sub>0</sub>). Among all the treatments, the benefit: cost ratio was found highest (3.93) under T<sub>8</sub>, followed by 3.26 in T<sub>4</sub>, however, it was found lowest (1.21) in T<sub>0</sub>. Thus, from economic point of view, fertigation dose of 75% RDN + 0.5% Ferrous sulfate + 0.2% Borax (T<sub>8</sub>) was found to be most suitable in *Tarai* conditions of Uttarakhand.

### Introduction

Peach [*Prunus persica* (L.) Batsch] belongs to the family Rosaceae and is one of the important stone fruit grown in temperate part of the world. Introduction of cultivated peaches into India, probably, took place in later half of 19<sup>th</sup> century. In India, the cultivation of peach is mostly confined to Uttarakhand, Jammu and Kashmir, Himachal

Pradesh, Punjab, Nilgiri and North-Eastern region. Peach along with its close relative nectarine, occupies about an area of 40762 hectare with total production of 287778 tonnes and productivity of 7.17 t/ha in India (Anonymous, 2016). During the past few years, cultivation of stone fruits, especially peach has become popular in the subtropical climate of North Indian plains. The horticultural produce, besides their high

nutritional value, help in generation of additional profit and employment through on-farm processing and marketing of fresh produce as well as processed products. The demand for stone fruits and their processed products has increased because of rise in health concerns and nutritional awareness.

The peach crop has been considered as highly sensitive to water and fertilizer applications. The conventional practice of fertilization and irrigation has given detrimental effect on the soil health and quality of produce, besides, poor nutrient and water use efficiency. One of the recent techniques of fertilization is fertigation, in which fertilizers are applied through drip irrigation systems (Bussi *et al.*, 1991), which permits the fertilizer application directly at the site of roots which results in improved fertilizer use efficiency (Singh *et al.*, 2005). Fertilization using such approach has found to improve yield attributes as well as produce quality fruits which fetch high profit from the market.

The economic evaluation of any experiment is very essential, as farmers are convinced with specific recommendation through economic aspect of the research. In recent past, only few studies have been conducted on economic survey of peach orchard (Gangwar *et al.*, 2008 and Gupta *et al.*, 2016), however, study on the economics of peach cultivation under fertigation level and foliar applications are lacking in study area, hence, the present study was conducted to work out the economics of peach cv. Shan-e-Punjab under different treatments.

## **Materials and Methods**

The present investigation was carried out at the Horticultural Research Centre, Patharchatta, G. B. Pant University of Agriculture and Technology Pantnagar, Uttarakhand to find out the most effective

combination of NPK fertigation with foliar application on economic performance of peach during 2015 and 2016 growing seasons. Five and six years old low-chill peach cultivar Shan-e-Punjab, planted at 5×5 meter, was used for the study. Based on recommended dose of fertilizer (420:240:300g NPK/tree/year), nine treatments *viz.*, [T<sub>1</sub> (100% of RDN + 0.25% Ferrous sulfate); T<sub>2</sub> (75% of RDN + 0.25% Ferrous sulfate); T<sub>3</sub> (50% of RDN + 0.25% Ferrous sulfate); T<sub>4</sub> (75% of RDN + 0.25% Ferrous sulfate + 0.2% Borax); T<sub>5</sub> (100% of RDN + 0.5% Ferrous sulfate); T<sub>6</sub> (75% of RDN + 0.5% Ferrous sulfate); T<sub>7</sub> (50% of RDN + 0.5% Ferrous sulfate); T<sub>8</sub> (75% of RDN + 0.5% Ferrous sulfate + 0.2% Borax) and T<sub>9</sub> (Control)] were formulated. In both the experimental year, the quantity of water soluble fertilizers [(N:P:K (20:20:20), urea, mono potassium phosphate and murate of potash)] were computed based on gram per tree per split requirement. Fertigation of NPK was done through venturi in 10 different split applications at 15 days intervals, starting from 15<sup>th</sup> December to continue till 30<sup>th</sup> of April, whereas, in case of control, fertilization was done as per the recommended practice in tree basin using urea, diammonium phosphate and murate of potash. However, the foliar applications of micronutrients (Fe and B) were performed during appropriate growth stages. The cost of fertilizers varied in different treatment while, other operational charges and inputs were almost same in all other treatments except fertilization cost in control.

The fruits were harvested from each tree during the month of May and yield was expressed in tonnes per hectare. The total expenditure per hectare (Table 1a and 1b) was worked out for all the treatments by adding all the costs (fertilizers and intercultural operations) for the purpose of experiment during two years and the values were

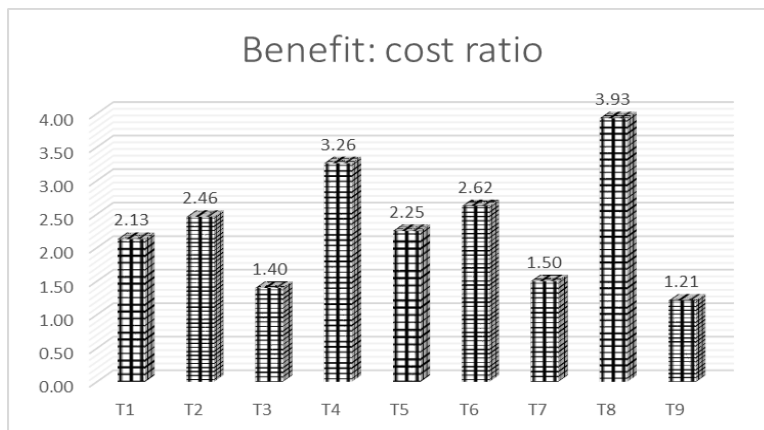
expressed in rupees. The gross income (Table 2) was worked out after selling the harvested fruits at prevailing market price (Rs. 50 per kg), subsequently, the net income (Table 2) was calculated by subtracting the total expenditure from the gross return. Finally, the return per rupees invested *i.e.*, benefit: cost ratio was calculated for all the treatments and compared with conventional method *i.e.*, control. The data regarding fruit yield attributes was subjected to statistical analysis in order to find out the treatment showed significant variation in different under study. The technique of analysis of variance (ANOVA) for randomized block design (RBD) was adopted as per Gomez and Gomez (1984).

### Results and Discussion

The data regarding economics of the experiment (total expenditure, yield, gross income and net income) on the basis of one hectare land, under different treatments have presented in Table 1a and b and 2. The careful scrutiny of data indicates that total expenditure was found highest being Rs. 107530.31 in 75% of RDN + 0.5% Ferrous

sulfate + 0.2% Borax (T<sub>8</sub>) followed by Rs. 106854.13 in 100% of RDN + 0.5% Ferrous sulfate (T<sub>4</sub>), whereas, lowest expenditure (Rs. 75478.71) was calculated in control (T<sub>9</sub>). Similarly, the maximum yield (10.61 t/ha) was recorded in T<sub>8</sub> and statistically found significantly superior than rest of the treatments, followed by (8.91 t/ha) in T<sub>4</sub>, however, the minimum yield (3.35 t/ha) was recorded in under control tress. Therefore, based on yield obtained in individual treatments, the highest gross income (Rs. 530500.00) was recorded in T<sub>8</sub>, followed by Rs. 445500.00 in T<sub>4</sub>, whereas, lowest gross income (Rs. 235500.00) was calculated in T<sub>9</sub>. Further, after deducting the total expenditure from the gross income of corresponding treatments, the highest net income (Rs. 422969.69) was calculated in T<sub>8</sub>, whereas it was found lowest (Rs. 92031.28) under T<sub>9</sub>. Finally, after calculating the all inputs, the benefit: cost ratio (Figure 1) was calculated, which was found maximum (3.93) under T<sub>8</sub> followed by 3.26 under T<sub>4</sub>. However, minimum benefit: cost ratio (1.21) was observed in T<sub>9</sub> followed by 1.40 in 50% of RDN + 0.25% Ferrous sulfate (T<sub>3</sub>) and 1.50 in 50% of RDN + 0.5% Ferrous sulfate (T<sub>7</sub>).

**Figure.1** Benefit: cost ratio analysis of peach cv. Shan-e-Punjab under different treatments during experimental years



**Table.1a** Expenditure cost (fertilizer and chemical) of peach cv. Shan-e-Punjab using different fertigation level and foliar applications

Treatments	Fertilizer and chemicals	Quantity (kg)	Unit price (Rs.)	Costs (Rs.)	Total costs (Rs.)
100% of RDN + 0.25% Ferrous sulfate (T <sub>1</sub> )	Urea (46:00:00)	191.30	6.0	1147.83	32412.14
	NPK (20:20:20)	80.00	230.0	18400.00	
	MPK (00:52:34)	30.77	357.0	10984.62	
	MOP (00:00:60)	49.23	16.0	787.69	
	Ferrous sulfate (0.25%)	3.00	364.0	1092.0	
75% of RDN + 0.25% Ferrous sulfate (T <sub>2</sub> )	Urea (46:00:00)	100.00	6.0	600.00	31864.31
	NPK (20:20:20)	80.00	230.0	18400.00	
	MPK (00:52:34)	30.77	357.0	10984.62	
	MOP (00:00:60)	49.23	16.0	787.69	
	Ferrous sulfate (0.25%)	3.00	364.0	1092.0	
50% of RDN + 0.25% Ferrous sulfate (T <sub>3</sub> )	Urea (46:00:00)	8.70	6.0	52.17	31316.48
	NPK (20:20:20)	80.00	230.0	18400.00	
	MPK (00:52:34)	30.77	357.0	10984.62	
	MOP (00:00:60)	49.23	16.0	787.69	
	Ferrous sulfate (0.25%)	3.00	364.0	1092.0	
75% of RDN + 0.25% Ferrous sulfate + 0.2% Borax (T <sub>4</sub> )	Urea (46:00:00)	100.00	6.0	600.00	33088.31
	NPK (20:20:20)	80.00	230.0	18400.00	
	MPK (00:52:34)	30.77	357.0	10984.62	
	MOP (00:00:60)	49.23	16.0	787.69	
	Ferrous sulfate (0.25%)	3.00	364.0	1092.0	
	Borax (0.2%)	2.40	510.0	1224.0	
100% of RDN + 0.5% Ferrous sulfate (T <sub>5</sub> )	Urea (46:00:00)	191.30	6.0	1147.83	33504.13
	NPK (20:20:20)	80.00	230.0	18400.00	
	MPK (00:52:34)	30.77	357.0	10984.62	
	MOP (00:00:60)	49.23	16.0	787.69	
	Ferrous sulfate (0.5%)	6.00	364.0	2184.0	
75% of RDN + 0.5% Ferrous sulfate (T <sub>6</sub> )	Urea (46:00:00)	100.00	6.0	600.00	32956.31
	NPK (20:20:20)	80.00	230.0	18400.00	
	MPK (00:52:34)	30.77	357.0	10984.62	
	MOP (00:00:60)	49.23	16.0	787.69	

50% of RDN + 0.5% Ferrous sulfate (T <sub>7</sub> )	Ferrous sulfate (0.5%)	6.00	364.0	2184.0	32408.48
	Urea (46:00:00)	8.70	6.0	52.17	
	NPK (20:20:20)	80.00	230.0	18400.00	
	MPK (00:52:34)	30.77	357.0	10984.62	
	MOP (00:00:60)	49.23	16.0	787.69	
75% of RDN + 0.5% Ferrous sulfate + 0.2% Borax (T <sub>8</sub> )	Ferrous sulfate (0.5%)	6.00	364.0	2184.0	34180.31
	Urea (46:00:00)	100.00	6.0	600.00	
	NPK (20:20:20)	80.00	230.0	18400.00	
	MPK (00:52:34)	30.77	357.0	10984.62	
	MOP (00:00:60)	49.23	16.0	787.69	
	Borax (0.2%)	2.40	510.0	1224.0	
Control (T <sub>9</sub> )	Urea (46:00:00)	283.55	6.0	1701.32	10118.71
	DAP (18:46:00)	208.70	25.0	5217.39	
	MOP (00:00:60)	200.00	16.0	3200.00	

(\*The calculation is based on one hectare land)

**Table.1b** Expenditure cost (intercultural operation) of peach cv. Shan-e-Punjab using different fertigation level and foliar applications

Operations	Labour engaged	Rate per day (Rs.)	Total costs (Rs.)
Pruning	75	250.00	18750.00
Ring preparation	10	250.00	2500.00
Fertilization	<b>Fertigation</b>	40	10000.00
	<b>Control</b>	08	2000.00
Irrigation	50	250.00	12500.00
Spraying	12	250.00	3000.00
Weeding	50	250.00	12500.00
Tractor	04	250.00	1600.00
Harvesting	20	250.00	5000.00
Electricity (50 hours)	-	150.00	7500.00
<b>Total</b>			73350.00 (Excluding control) 65350.00 (Control)

(\*The calculation is based on one hectare land)

**Table.2** Economics of the experiment using different variables in peach cv. Shan-e-Punjab during experimental years

Treatments	Total expenditure (Rs.)	Yield (tonne)	Gross income (Rs.)	Net income (Rs.)
100% of RDN + 0.25% Ferrous sulfate (T <sub>1</sub> )	105762.14	6.62	331000.00	225237.86
75% of RDN + 0.25% Ferrous sulfate (T <sub>2</sub> )	105214.31	7.28	364000.00	258785.69
50% of RDN + 0.25% Ferrous sulfate (T <sub>3</sub> )	104666.48	5.03	251500.00	146833.52
75% of RDN + 0.25% Ferrous sulfate + 0.2% Borax (T <sub>4</sub> )	104666.48	8.91	445500.00	340833.52
100% of RDN + 0.5% Ferrous sulfate (T <sub>5</sub> )	106854.13	6.95	347500.00	240645.87
75% of RDN + 0.5% Ferrous sulfate (T <sub>6</sub> )	106306.31	7.69	384500.00	278193.69
50% of RDN + 0.5% Ferrous sulfate (T <sub>7</sub> )	105758.48	5.28	264000.00	158241.52
75% of RDN + 0.5% Ferrous sulfate + 0.2% Borax (T <sub>8</sub> )	107530.31	10.61	530500.00	422969.69
Control (T <sub>9</sub> )	75468.71	3.35	167500.00	92031.28
CD at 5%	-	0.51	-	-

(\*The calculation is based on one hectare land)



In the present investigation higher economics was reported under treatment T<sub>8</sub> followed by T<sub>4</sub>. The trend obtained might be due to the fact that in treatments, T<sub>8</sub> and T<sub>4</sub> higher yield and consequently, higher income was obtained. On the other hand, lowest income obtained under T<sub>9</sub>, which is attributable to least performance of trees under study because of improper fertilization management in conventional method.

The similarly findings of higher benefit: cost ratio (1.53 and 2.91) with fertigation treatments of 75% recommended dose of fertilizer (RDF) was reported in papaya (Sadarunnisa *et al.*, 2010) and guava (Ramniwas *et al.*, 2013) orchards. Further, in high density orchard of citrus, higher benefit: cost ratio (2.47) was obtained with fertigation of 60% RDF [9]. The more or less similar observations were also made in kiwifruit (Chauhan and Chandel, 2008) and pomegranate (Haneef *et al.*, 2014) field using different fertigation treatments.

In conclusion, the study has revealed that investment in peach orchards is an economically profitable, financially viable and socially acceptable business in study area. A positive correlation has also been observed between the different treatments and net income. Hence, to achieve the target of fruits production, priority should be given to proper fertilization management, including scheduling, optimum rate and use of fertigation with respect to conventional methods to minimize fertilizer as well as water losses and provide remunerative prices to the peach growers in *Tarai* regions of Uttarakhand. Therefore, to enhance peach production, there is a need to adopt such a smarter and efficient technology for fetching higher returns without affecting the physical and chemical properties of soil, from same piece of land.

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