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Effect of round the year pruning and fertilizer doses on physico-chemical parameters of phalsa cv. Local

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Abstract

An experiment was carried out to find out the effects of round the year pruning and fertilizer doses on physico-chemical parameters of phalsa cv. Local during the years 2020-21 and 2021-22. The experiment consist of two factors one is pruning time ($P_1= 1^{\text{st}}$ week of January (Control), $P_2= 1^{\text{st}}$ week of March, $P_3= 1^{\text{st}}$ week of May, $P_4= 1^{\text{st}}$ week of July, $P_5= 1^{\text{st}}$ week of September and $P_6= 1^{\text{st}}$ week of November) and second is fertilizer doses ($F_1= 100:50:50$ g NPK/plant (Control), $F_2= 200:75:75$ g NPK/plant, $F_3= 300:100:100$ g NPK/plant). The experiment was laid out in completely randomized design (Factorial) with three repetitions. The treatment of pruning in 1^{st} week of January (Control) (P_1) reported maximum weight of 100 fruits, juice content, total soluble solids, reducing sugars, total sugars, and ascorbic acid and minimum seed content, seed: juice ratio and acidity of phalsa fruit. The fertilizer treatment F_2 (200:75:75 g NPK/plant) recorded maximum weight of 100 fruits, juice content, total soluble solids, reducing sugars, total sugars, and ascorbic acid of phalsa fruits. The treatment F_1 [100:50:50 g NPK/plant (Control)] registered the minimum acidity of phalsa fruits. The pruning in 1^{st} week of January with fertilizer application of 200:75:75 g NPK/plant improve the physico-chemical parameters of the phalsa.

Keywords: Phalsa, Pruning time, Fertilizer Doses, Physico-chemical parameters

Introduction

Phalsa is an Indian origin shrub or small tree. It belongs to genus *Grewia* of the family Malvaceae. It is primarily grown on a commercial scale in northern and western India. The popularity of phalsa fruits is limited by its small fruit size, extended ripening period, repetitive pickings and highly perishable nature. Phalsa fruits are small and purple colour when ripe. The fruits are grown in bunches and have a peduncle that is 2 to 3 cm long. Botanically the fruit is of drupe type. Fruits are 1.0-1.5 cm in length and 1.0-2.0 cm in diameter with average weight of 1.0-2.0 g. When the fruits ripen, they change from light green to cherry red or purplish red, and then to dark purple. The fruits have mild flavor with sweet acidic taste. Fruits contain on seed which is hemispherical and 5-7 mm in size. Phalsa fruits contain 50-60% juice, 10-11% sugar, and 2.0-2.5 percent acid (Aykroyd 1963) [1].

Pruning is regarded an essential operation in Phalsa since fruit buds are observed on current season growth to ensure a good yield. Annual pruning is required for high yield in phalsa. Furthermore, the intensity of pruning as well as the proper time of pruning may be highly essential for boosting fruit production and quality. It has also been observed that the timing of pruning may regulate fruit ripening in phalsa, resulting in orderly marketing of this perishable fruit, which can benefit both farmers and consumers. Fertilizer application in phalsa influence the vegetative growth, flowering, fruit set, yield and fruit quality of phalsa. Fertilizer application have significant effect on fruit size, fruit weight, sugar content and acidity of phalsa fruits. High potassium levels boost sugar content in the fruit, whereas high phosphorus levels decrease sugar and encourage acidity.

The present experiment entitled "Effect of round the year pruning and fertilizer doses on physico-chemical parameters of phalsa cv. Local" was therefore aimed to get the quality fruits of phalsa throughout the year by round the year pruning of phalsa with fertilizer application.

Material and Methods

The experiment was conducted on two years old phalsa plants having uniform vigour at Horticulture Research farm, Anand Agricultural University, Anand in the years 2020-21 and 2021-22. The soil of the experiment field is loamy sand with soil pH (7.30), available N (233.35 kg/ha), available P (42.57 kg/ha) and Available K (265.45 kg/ha). The experiment consist of two factors one is pruning time ($P_1= 1^{\text{st}}$ week of January (Control), $P_2= 1^{\text{st}}$ week of

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March, P₃= 1st week of May, P₄= 1st week of July, P₅= 1st week of September and P₆= 1st week of November) and second is fertilizer doses (F₁= 100:50:50 g NPK/plant (Control), F₂= 200:75:75 g NPK/plant, F₃= 300:100:100 g NPK/plant). The experiment was laid out in completely randomized design (Factorial) with three repetitions.

Phalsa plants were pruned with sharp secateurs during the first week of each month at a height of 1 m from ground level based on the treatments. At the time of pruning, well-prepared vermicompost (5 kg per plant) and chemical fertilizers were applied in accordance with the treatments. Nitrogen was applied as urea and diammonium phosphate (DAP), phosphorous was applied as diammonium phosphate (DAP), and potassium was applied as muriate of potash (MOP). The manures and fertilizers were applied and incorporated into the soil by digging rings around the plants.

The observations were recorded on weight of 100 fruits, juice content, seed content, Seed: juice ratio, total soluble solids, reducing sugars, total sugars, acidity and ascorbic acid content of phalsa fruits. Total soluble solids (TSS) of fruit juice was recorded using a digital refractometer. The reducing sugars, total sugars, acidity and ascorbic acid content of fruits was estimated by the methods suggested by Ranganna (1979) [13].

Result and discussion

Effect of round the year pruning and fertilizer doses on physical parameters of phalsa fruits:

The data regarding effect of round the year pruning and fertilizer doses on physical parameters of phalsa are presented in Table 1. Pruning time had a significant effect on weight of 100 fruits, juice content, seed content and seed: juice ratio. The treatment pruning in 1st week of January (Control) (P₁) recorded significantly maximum weight of 100 fruits (70.55 and 71.88 g) and minimum seed: juice ratio (0.761 and 0.739)

in both the years of 2020-21 and 2021-22. The significantly maximum juice content (52.46 and 52.79%) was observed in treatment P₁ [1st week of January (Control)] in the years 2020-21 and 2021-22 which was at par with P₂ (1st week of March) in both the years. The significantly minimum seed content (39.89 and 39.03%) was registered with treatment of pruning in 1st week of January (Control) (P₁) in 2020-21 and 2021-22 which was found at par with P₂ (1st week of March) in year 2020-21. The higher fruit weight in summer season is due to phalsa prefers summer season for ideal growth and development of fruits because of high temperature and optimum humidity. The juice content of phalsa fruits was found higher in summer season crop than in rainy and winter season crop. This might be due to fact that the requirements of phalsa crops are full filled by ideal climatic conditions in summer season. Similar findings were reported by Bhuva *et al.* (1995) [3], Ghaffoor *et al.* (2001) [5], Meghwal (2006) [12] and Mahida *et al.* (2022) [11] in phalsa.

Fertilizer doses treatments had a significant effect on weight of 100 fruits and juice content. The significantly maximum weight of 100 fruits (63.31 and 65.13 g) and juice content (47.52 and 47.79 g) was recorded in treatment F₂ (200:75:75 g NPK/plant) in both the years 2020-21 and 2021-22 which was found at par with treatment F₃ (300:100:100 g NPK/plant). This might be due to the combine application of nitrogen and potassium boosted the assimilatory ability of the leaves, allowing them to synthesize more metabolites, resulting in larger fruit weight in phalsa. Fertilizer application increases nutrient uptake and the plant absorbs more water and minerals which results in higher turgor pressure and leads to the increase in juice percentage. Similar findings were found by Kumar *et al.* (2014) [9], Gill *et al.* (2015) [6] and Gochar *et al.* (2017) [7] in phalsa.

Table 1: Effect of round the year pruning and fertilizer doses on physical parameters of phalsa

Treatment	Weight of 100 fruits (g)		Juice content (%)		Seed content (%)		Seed: juice ratio	
	2020-21	2021-22	2020-21	2021-22	2020-21	2021-22	2020-21	2021-22
Pruning time								
P ₁	70.55	71.88	52.46	52.79	39.89	39.03	0.761	0.739
P ₂	63.80	65.77	51.28	51.67	41.71	40.21	0.813	0.778
P ₃	63.08	65.24	49.53	49.93	41.72	40.91	0.843	0.819
P ₄	61.77	62.81	43.06	43.24	40.41	40.39	0.939	0.934
P ₅	58.71	60.13	46.90	48.14	39.91	39.50	0.851	0.820
P ₆	56.45	58.27	39.16	38.97	40.26	40.07	1.029	1.029
SE(m)±	0.34	0.42	0.46	0.38	0.54	0.46	0.010	0.008
CD at 5%	0.97	1.20	1.33	1.10	1.54	NS	0.028	0.022
Fertilizer doses								
F ₁	60.49	62.07	46.38	46.96	40.02	39.58	0.872	0.853
F ₂	63.61	65.13	47.52	47.79	40.79	40.06	0.867	0.849
F ₃	63.08	64.85	47.29	47.62	41.15	40.41	0.879	0.858
SE(m)±	0.24	0.30	0.33	0.27	0.38	0.33	0.007	0.005
CD at 5%	0.68	0.85	0.94	NS	NS	NS	NS	NS

Effect of round the year pruning and fertilizer doses on chemical parameters of phalsa:

The data regarding effect of round the year pruning and fertilizer doses on chemical parameters of phalsa are presented in Table 2. Pruning time and fertilizer doses had significant effect on TSS, reducing sugars, total sugars, acidity and ascorbic acid of phalsa fruits. Pruning time 1st week of January (Control) (P₁) recorded significantly maximum TSS (21.07 and 21.56°B), reducing sugars (8.29 and 8.89%), total sugars (11.79 and 12.07%) and ascorbic

acid (32.47 and 32.90 mg/100 g) in both the years 2020-21 and 2021-22 which was found at par with P₂ (1st week of March) in both the years. The significantly minimum acidity (1.65 and 1.75%) was also observed in treatment of pruning on 1st week of January (Control) (P₁) in the years 2020-21 and 2021-22. The quality of phalsa fruits was better in summer season crop than rainy and winter season crop. This might be due to higher temperatures in summer season increased the photosynthetic activity which ultimately leads to the accumulation of large amount of carbohydrates and sugars

which increased total soluble solids and decreased acidity of the fruits. Similar results were reported by Bhuvu *et al.* (1995) [3], Meghwal (2006) [12], Singh *et al.* (2006) [17], Aziz *et al.* (2018) [2] and Mahida *et al.* (2022) [11] in phalsa and Sharif *et al.* (2018) [16] in ber.

In terms of fertilizer doses, treatment F₂ (200:75:75 g NPK/plant) recorded significantly maximum TSS (18.51 and 19.40°B), reducing sugars (7.32 and 7.71%), total sugars (11.04 and 11.23%) and ascorbic acid (28.87 and 29.98 mg/100 g) in both the years 2020-21 and 2021-22 which was found at par with F₃ (300:100:100 g NPK/plant) in both the years. The significantly minimum acidity was found in treatment F₁ [100:50:50 g NPK/plant (Control)] in the years 2020-21 and 2021-22. Nitrogen helps in the chlorophyll synthesis and increase photosynthetic activity of plant which

leads to build up of carbohydrates and increase total soluble solids and sugars of the fruits. Potassium plays an important role in sugar translocation from leaves to the fruits which increase sugar content in phalsa fruits. Nitrogen, phosphorous and potassium boosted the ascorbic acid content of fruit juice by increasing the synthesis of catalytic activity of various enzymes and co-enzymes involved in ascorbic acid synthesis. Higher doses of nitrogen and phosphorous increases the synthesis of metabolites and enzymes which leads to higher fruit acidity. Similar results were reported by Saravanan *et al.* (2013), Kumar *et al.* (2014) [9], Gill *et al.* (2015) [6] and Gochar *et al.* (2017) [7] and Mahida *et al.* (2022) [11] in phalsa and Kumar *et al.* (2009) [8], Kumar *et al.* (2013) [10] and Choudhary *et al.* (2017) [4] in ber.

Table 2: Effect of round the year pruning and fertilizer doses on chemical parameters of phalsa

Treatment	TSS (°B)		Reducing sugars (%)		Total sugars (%)		Acidity (%)		Ascorbic acid (mg/100 g)	
	2020-21	2021-22	2020-21	2021-22	2020-21	2021-22	2020-21	2021-22	2020-21	2021-22
Pruning time										
P ₁	21.07	21.56	8.29	8.89	11.79	12.07	1.65	1.75	32.47	32.90
P ₂	19.90	20.47	7.96	8.72	11.48	11.62	1.79	1.83	31.47	31.97
P ₃	17.13	18.20	6.20	7.41	10.84	10.88	2.17	2.19	27.47	28.85
P ₄	14.91	16.20	6.12	6.00	9.67	10.13	1.92	2.02	24.46	25.54
P ₅	17.37	18.30	6.42	6.54	10.28	10.40	1.94	2.06	30.42	31.39
P ₆	15.47	16.60	7.17	7.37	10.73	10.88	1.88	1.99	23.49	24.86
SE(m)±	0.43	0.41	0.12	0.10	0.18	0.16	0.03	0.03	0.38	0.41
CD at 5%	1.22	1.17	0.35	0.27	0.50	0.47	0.08	0.07	1.10	1.17
Fertilizer doses										
F ₁	16.27	17.17	6.56	7.11	10.57	10.63	1.77	1.87	27.24	28.21
F ₂	18.51	19.40	7.32	7.71	11.04	11.23	1.91	2.00	28.87	29.98
F ₃	18.14	19.09	7.19	7.65	10.79	11.13	2.00	2.05	28.78	29.57
SE(m)±	0.30	0.29	0.09	0.07	0.12	0.12	0.02	0.02	0.27	0.29
CD at 5%	0.86	0.83	0.24	0.19	0.36	0.33	0.05	0.05	0.78	0.82

Conclusion

The results of the present study revealed that pruning in 1st week of January improve the fruit weight, juice content, total soluble solids, reducing sugars, total sugars and ascorbic acid content of phalsa fruits. The fertilizer dose of 200:75:75 g NPK/plant increased the fruit weight, juice content, total soluble solids, reducing sugars, total sugars and ascorbic acid content of phalsa fruits. The pruning in 1st week of January with fertilizer application of 200:75:75 g NPK/plant improve the physico-chemical parameters of the phalsa.

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