Phalsa (*Grwia subinaequalis* L.) 10

Abstract

India is considered to be the home of phalsa (*Grewia asiatica*). In early literature, phalsa is mentioned for its medicinal qualities. It belongs to the family Tiliaceae. Phalsa is a hardy fruit which is capable of growing even under drought conditions. Once the plant is established, it requires little care. Irrigation is considered necessary in many parts of the country. Phalsa is a small bush which grows all over the country except at higher elevations. In Punjab, Haryana, Uttar Pradesh, and Andhra Pradesh, it is grown commercially. Harvesting of phalsa is labor intensive. Phalsa sherbet is a refreshing drink in hot summer months and has a cooling effect.

10.1 Introduction

The origin of phalsa is India. It has a chromosomal status $2n=18$. Phalsa belongs to the family Tiliaceae. The genus *Grewia* has 140 species out of which 40 occur in India. The wild species *Grewia elastica* grows on the lower hills all over India; other important species are *Grewia glabra, Grewia microcos, Grewia tiliifolia*, and *Grewia villosa.*

It is often a cross-pollinated crop, and insects are the chief pollinating agents.

The plant genetic resource status of phalsa indicated that there are no distinct cultivars available in the country.

Phalsa is a small bush, which bears many small berrylike fruits. Its popularity is restricted by the fact that the fruit is very perishable and the tiny fruits have to be picked from a bush several times during fruiting season.

10.2 Reproductive Biology

In the current year's growth, the axillary flowers are borne with 2–9 peduncles of 2.5 cm length each. Each peduncle has 3–6 pedicellate flowers. There were about 18–47 peduncles on each branch. Flowering started in the third week of November and continued till the last week of February. Randhawa and Dass (1962) reported flowering in phalsa during March–May. Anthesis started at 6 am and continued up to 3 pm with a peak at 10 am. The dehiscence commenced from 7 am and continued till 1 pm with a peak at 10

S. Hiwale, *Sustainable Horticulture in Semiarid Dry Lands*,
DOI 10.1007/978-81-322-2244-6_10, © Springer India 2015

am. Stigma receptivity was maximum on the day of anthesis (Narayan Swamy et al. 1986).

10.3 Varietal Development

Types such as local and sharbati are popular. Two distinct types, tall and dwarf, have been recognized, of which dwarf types were found more productive. Two types on the basis of fruit size (bigger and smaller) have been identified and evaluated at Godhra.

10.4 Soil

It can grow under a wide variety of soil and is considered to be one of the hardiest fruits that is drought resistant. Well-drained loamy soils are preferred. In stagnant water the plant becomes chlorotic. They are moderately sensitive to salinity (up to 6 mmhos/cm), and in calcareous soils Fe chlorosis is a common problem. Rich loam is considered to be an ideal soil for its profitable cultivation.

10.5 Crop Production

10.5.1 Propagation

Phalsa is commonly raised by seed. The seeds are collected from fresh ripe fruits at harvest. They are sown in well-prepared nursery beds at 5–7 cm apart in rows normally kept at 25–30 cm apart. The best time for sowing is July–August. The seedlings thus raised are ready for transplanting in the months of February–March or July–August.

Only a few attempts on asexual method of propagation have been made with success. Shield and ring budding in the month of June have met with 90 and 82 % success, respectively. Significant success was achieved in propagating phalsa by hardwood cuttings during the rainy season. Treating the cuttings with 100 ppm indole butyric acid has been found beneficial in rooting. The cuttings are dipped in indole butyric acid (1,000 ppm) solution prepared in 50 % alcohol for about 5 s and then planted in nursery beds (Singh 1974).

The phalsa is planted at a distance of 3–4 m apart by square system of planting. It should be planted in well-mannered pits measuring $0.6 \times 0.6 \times 0.6$ m. February is considered to be the best month for planting when the seedlings can be lifted without the ball of earth. Seedlings can be transplanted in July–August with a little more care. They should be lifted with the ball of earth.

10.5.2 Nutrition and Nutritional Status

Being a hardy crop, fertilization is hardly practiced. But since the bearing is on new growth, it would definitely respond to fertilization. Nijjar (1969) considered 1 kg N/plant to be sufficient for a good crop. However, Chundawat and Gupta (1974) believed that application of 15 kg FYM after pruning followed by 125 g N/plant after sprouting is optimum for high production. Pundir and Pathak (1981) recorded high yield in phalsa by the application of N, P, and K at 100, 40, and 25 kg/ha, respectively. This plant is very sensitive to Fe^{-} deficiency; therefore, spray of 0.4 % $FeSO_4$ would benefit the plants. Beneficial effects of $ZnSO_4$ (0.5 %) and $FeSO_4$ (0.4 %) have also been recorded by Singh et al. (1981). These sprays can be applied at prebloom and post-bloom stages.

10.5.3 Manuring

Manuring in phalsa is not commonly practiced as it is grown as a wasteland crop. However, if regular manuring schedule is adopted, phalsa can give better returns. About 10–15 kg farmyard manure is considered as an adequate dose for each plant. Manuring should be done in late January, immediately after the bushes are pruned. Manure should be properly mixed in soil. One irrigation immediately after manuring is beneficial.

10.5.4 Irrigation

Phalsa is regarded as a drought-tolerant crop. However, it has been observed that irrigation is necessary for quality and big harvest. Irrigations at 2–3-week interval during summer are desirable.

10.5.5 Soil Management

During the rainy season green manure crop could be taken which can be plowed in at flowering stage; for the whole winter the field can be left untilled, and with pruning it can be deep plowed to clear off weeds and mixed with FYM during summer. The field has to be kept free of weeds to allow good fruiting.

10.5.6 High-Density Plantation

High-density planting in phalsa was done with Neddlers fan design under semiarid conditions. The results indicated that maximum plant population of 8,333 plants per hectare can be accommodated in 3 m × 04 m spacing. Though the yield per plant was the least, maximum B.C. ratio of 2.78 was recorded closely followed by 3 × 0.8 m spacing. The least B.C. ratio (2.28) was recorded in 3 m × 1.2 m spacing which may be due to higher cost of cultivation (Hiwale 2007) (Table 10.1).

- *High-density in phalsa; Neddlers fan design*

Treatments

1. 1.3 m × 0.4 m = 8333 plants/ha
2. 3 m × 0.8 m = 4166 plants/ha
3. 3 m × 1.2 m = 2,722 plants/ha
4. 3 m × 1.7 m = 1,960 plants/ha
5. 3 m × 2.1 m = 1,587 plants/ha
6. 3 m × 2.4 m = 1,388 plants/ha

10.5.7 Pruning and Training

Pruning phalsa to different intensities significantly influenced the production of the number of sprouts/shoots as well as yield per plant. Physicochemical characters were not affected significantly. The maximum number of sprouts

Table 10.1 Yield, net return, and B.C. ratio in high-density plantation of phalsa

Spacing	Plants/ha	Yield kg/plant	Yield q/ha	Cost of cultivation (Rs.)	Gross return (Rs.)	Net return (Rs.)	B.C. ratio
3 m × 0.4 m	8,333	0.87	72.49	26,000	72,490	46,490	2.78
3 m × 0.8 m	4,166	1.37	57.07	21,000	57,070	36,070	2.71
3 m × 1.2 m	2,722	1.40	38.88	17,000	38,880	21,880	2.28
3 m × 1.7 m	1,960	1.42	27.83	12,000	27,830	15,830	2.31
3 m × 2.1 m	1,587	1.48	23.48	9,000	23,480	14,480	2.60
3 m × 2.4 m	1,388	1.53	21.24	8,000	21,240	13,240	2.65

Phlasa planting fan design

Phalsa in bearing

was produced in plants pruned to 50 % of the previous season's growth. Fruit set per shoot as well as yield per plant was also highest in plants pruned to 50 % intensity (1.416 kg/plant). In respect to physicochemical characters, fruit weight and fruit length were significantly influenced by different pruning treatments. The maximum fruit weight and length were recorded in ground-level pruning which may be due to less no fruit set and more leaf area. TSS and acidity were not significantly influenced (Tables 10.2 and 10.3).

Studies carried out on the effect of time of pruning under semiarid conditions of central Gujarat with four treatments, viz., pruning plants in the first week of December and subsequent treatments at 15 days' interval, indicated that plants pruned in the first week of December produced the maximum number of sprouts/plants resulting in higher fruit set (63.01 %) and yield per plant (1.53 kg/plant). Analysis of physicochemical characters revealed that fruit weight was significantly influenced by various treatments. Data on other characters was not significantly influenced by various pruning treatments (Hiwale and Raturi 1990).

10.6 Use of Plant Growth Regulators

Spray of GA 60 ppm plus urea 1 % during flowering reduced the duration of harvest, while GA 60 ppm plus 2,4,5-t ppm was effective increasing the fruit size and yield (Chundawat and Singh 1980). Ethephon 500 ppm at color break stage considerably reduced the number of pickings (Singh et al. 1981) (Table 10.4).

Work carried out at CHES, Vejalpur, under semiarid condition on the effect of growth regulators on growth yield and quality of phalsa indicated that the plants that were sprayed with GA at 75 ppm concentration produced maximum shoot length (53.5 cm) and maximum diameter in GA 100 ppm (5.45 mm). Maximum percent fruit set and yield per plant were recorded in NAA 50 ppm spray (58.4 % and 1.41 kg/pl, respectively). 2,4-D at both 2.5 and 5 ppm restricted the shoot growth resulting in the least fruit set and yield (44.7 % and 0.87 kg/pl), respectively. Thus, application of NAA at the rate of 50 ppm spray immediately after sprouting increased yield per plant as well as fruit weight.

Table 10.2 Effect of pruning intensity on growth, yield, and quality of phalsa

Treatment	No. of sprout/ plant	% set	Yield kg/plant	Fruit weight (g)	Fruit length (mm)	Fruit dia. (mm)	TSS ° Brix	Acidity (%)
25 %	62.00	62.72	1.069	0.47	8.29	9.33	25.10	2.68
50 %	66.75	65.89	1.416	0. 56	9.99	9.31	26.40	2.84
75 %	49.25	60.71	1.25	0.51	9.57	9.06	27.55	2.56
Ground level	29.50	60.15	0.64	0.69	10.11	10.35	28.3	2.67
Control	21.50	59.43	0.40	0.50	8.10	9.24	24.85	2.76
CD at 5%	27.33	1.77	0.29	0.049	0.128	NS	NS	NS

Table 10.3 Effect of pruning time on growth, yield, and quality of phalsa

Treatment	No. of sprout/ plant	% set	Yield kg/plant	Fruit weight (g)	Fruit length (mm)	Fruit dia. (mm)	TSS ° Brix	Acidity (%)
First week of December	103.2	63.01	1.53	0.61	9.06	9.60	25.16	2.24
Middle of December	90.8	61.18	1.44	0.56	8.40	9.04	25.00	2.41
First week of January	53.0	60.77	1.03	0.51	8.34	8.4	22.,64	2.49
Middle of January	77.4	59.9	1.15	0.47	8.03	8.76	23.68	2.54
CD at 5 %	18.84	NS	0.163	0.085	NS	NS	NS	NS

Table 10.4 Effect of plant growth regulators on growth, yield, and quality of phalsa

Treatment	Shoot length (cm)	Shoot dia. (mm)	% set	Yield kg/plant	Fruit weight (g)	Fruit length (mm)	Fruit dia. (mm)	TSS ° Brix	Acidity (%)
GA 50 ppm	49.2	5.02	55.1	1.17	0.48	8.3	9.6	27.0	4.23
GA 75 ppm	55.5	5.17	50.3	1.23	0.42	7.8	8.4	26.1	4.41
GA 100 ppm	51.72	5.45	47.6	1.05	0.49	8.4	9.2	27.1	3.86
NAA 50 ppm	47.12	4.80	58.4	1.41	0.64	8.8	9.9	27.1	3.57
NAA 75 ppm	45.47	4.75	47.2	1.23	0.60	9.0	9.7	26.8	3.64
NAA 100 ppm	48.9	5.0	47.9	1.12	0.65	8.9	9.9	26.9	3.98
2, 4-D 2.5 ppm	37.6	3.95	50.8	1.03	0.62	9.0	9.9	26.7	3.50
2,4-D 5 ppm	38.5	3.97	48.6	0.98	0.58	8.7	8.8	25.2	4.14
Control	40.5	4.20	44.7	0.87	0.41	8.0	7.9	26.5	3.37
CD at 5 %	4.08	0.615	5.45	0.67	0.105	0.778	0.692	NS	NS

References

Chundawat BS, Gupta OP (1974) Effect of growth retardants on vegetative growth and yield of phalsa (*Grewia asiatica*). Haryana J Hortic Sci 3(3 & 4):113–115

Chundawat BS, Singh R (1980) Effect of plant growth regulators on fruit size and yield in phalsa. Indian J Hort 37(2):124–131

Hiwale SS (2007) High density planting in arid and semi-arid fruit crops. In book entitled "Advances in Arid zone fruit culture", Patil RS (ed), pp 61–67

Hiwale SS, Raturi GB (1990) Effect of time of pruning on growth and yield of Phalsa (*Grewia subinaequalis* L.). In: National symposium on fruit crops, IARI, New Delhi during November 1990

Narayan Swamy P, Mokashi AN, Mohan Kumar GN, Nalwadi UG, Dever KV (1986) Floral biology of phalsa (*Grewia asiatica* L.). South Indian Hortic 34(2):115–116

Nijjar GS (1969) Phalsa in Punjab. J Res, P.A.U. Ludhiana 6:848–858

Pundir JPS, Pathak SP (1981) Abstract national symposium on tropical and subtropical fruits, Bangalore, 21–24 January 1981. Horticulture Society of India, New Delhi

Randhawa GS, Dass HC (1962) Studies on floral biology of phalsa (*Grewia asiatica* Linn.). Indian J Hortic 19:10–14

Singh JP (1974) The Phalsa. Indian Hortic 19(3):15–16

Singh R, Bagde TR, Sharma VP (1981) Studies on the effect of some plant growth regulators on the yield and duration of harvesting in phalsa (*Grewia subinaequalis* L.) National symposium on tropical and sub tropical fruit crops, Bangalore. Horticultural Society of India, pp 116