

Wild Apricot



National Oilseeds and Vegetable Oils Development Board
(Ministry of Agriculture, Govt. of India)
Plot No. 86, Sector -18, Institutional Area, Gurgaon- 122015



सत्यमेव जयते

सचिव, भारत सरकार
Secretary
Government of India

P.K. Mishra



भारत सरकार
कृषि मंत्रालय
कृषि एवं सहकारिता विभाग
कृषि भवन, नई दिल्ली-110001
Government of India
Ministry of Agriculture
Department of Agriculture & Cooperation
Krishi Bhawan, New Delhi-110001
दूरभाष/Phone : 23382651, 23388444
फैक्स/Fax No. 23386004

PREFACE

It gives me immense pleasure to learn that the National Oilseeds & Vegetable Oils Development (NOVOD) Board, Gurgaon is implementing various programmes such as development of elite planting material and model plantation, research & development, technology transfer and awareness for promotion of Wild Apricot in the potential temperate areas of the country. The efforts of NOVOD Board for publishing a book on Wild Apricot are commendable. This book covers important technical aspects: origin, distribution, soil & climate, botanical description, propagation techniques, planting methodology, training & pruning, weed control, nutrient management, fruit thinning, irrigation, pests and diseases, harvesting and yield, oil extraction, utilization, etc.

I appreciate the commendable efforts of the board in bringing out such an important technical booklet and hope that it will help farmers, agro-based entrepreneurs, farming community and others to enhance their income from limited resources by growing more trees of Wild Apricot in the potential states and generating rural employment opportunities for the poor masses.

5th October 2007
New Delhi

(P. K. Mishra)



राष्ट्रीय तिलहन एवं वनस्पति तेल विकास बोर्ड National Oilseeds & Vegetable Oils Development Board

(कृषि मंत्रालय, भारत सरकार Ministry of Agriculture, Govt of India)

दूरभाष Phone : कार्यालय Office : (0124-2343181, 2341251), फैक्स Fax : 2340614, 2343281

डॉ० एम. एस. पूनिया
कार्यकारी निदेशक

DR. M.S. PUNIA
Executive Director



86, सेक्टर-18, संस्थानिक क्षेत्र,
गुडगांव - 122015 (हरियाणा)
86, Sector-18, Institutional Area,
Gurgaon-122015 (Haryana)

FOREWORD

India is the seventh largest country in the world after Russia, Canada, China, USA, Brazil and Australia covering geographical area of 328 million ha., which constitutes 2.42 percent of earth's surface. India with 109 crore population is the second most populous nation of the world after China. India is a leading player in edible oils, being the largest importer and the third largest consumer (after China and EU). The per capita consumption of edible oil is around 10 kg per year. The edible oil demand is expected to grow by 3-4% per annum over the next five to ten years, which translates into an additional requirement of 0.3 to 0.4 million tonnes per annum, reaching a total of 14.8 and 18.3 million tonnes by the end of 2010 and 2015, respectively.

The demand for edible oils is continuously on rise due to increasing population, fast urbanization leading to decrease of net cultivated areas, fast moving groups towards western food habits, oilseeds being grown under rainfed conditions, rising income etc. The demand and supply gap is bridged with the import of vegetable oils. This will become a horrible situation if the present trends continue. Therefore, there is need to trap the existing potential of alternative sources found in plain and hilly areas. Among the various alternative sources, the potential of Tree Borne Oilseeds is the most valuable, which needs to be explored.

Among these oilseeds, the wild apricot (*Prunus armeniaca* Linn) belonging to Rosaceae family and locally called Chullu is an important oilseed of tree-origin, found in dry temperate regions of North-Western Himalayas. It is a hardy plant species with economic age of 50-60 years and having 45-50% oils in kernel, which resembles almond oils. The oil is used for medicinal, cosmetic, confectionary purpose. The cake after extraction of oil can be used as manure as it contains nitrogen (6.64%), phosphorus (2.2%) and potash (1.14%). The cake can also be used as cattle feed after detoxification of anti-nutritional factor namely hydro-cyanic acid. It can also be used as bio-fuel.

The NOVOD Board has brought out various technical bulletins on TBOs namely Neem, Jojoba, Jatropha etc. Continuing this efforts, a book on wild apricot is published by the Board, covers all important technical aspects namely origin, distribution, soil & climate, botanical description, propagation techniques, planting methodology, training & pruning, weed control, nutrient management, fruit thinning, irrigation, pests and diseases, harvesting, fruit yield, oil extraction, utilization etc.

I hope that this book will definitely help the farmers, agricultural scientists, agriculturist and others, who are involved in promotion of wild apricot in the potential areas. The result based technical informations will boost the potential of this important plant resulting in generation of additional income, employment, availability of vegetable oils; reducing import burden etc. The suggestions of readers are welcome to make this booklet more useful.

I congratulate to the NOVOD Board officers and officials who are directly and indirectly involved in bringing out this technical publication successfully.

M.S. Punia

Dated: 16th October 2007

(M.S.Punia)

WILD APRICOT

R. S. Kureel
C.B. Singh
A.K. Gupta
Ashutosh Pandey



National Oilseeds & Vegetable Oils Development Board
(Ministry of Agriculture, Govt. of India)
86, Sector-18, Institutional Area
Gurgaon - 122015

WILD APRICOT

Subject	Page No
1. Origin and Distribution	1
2. Soil and Climate	1
3. Description	2
4. Propagation	2
4.1 Seed propagation	
4.2 Vegetative propagation	
4.2.1. Stem cuttings	
4.2.2. Grafting	
5. Planting Operation	4
6. Training and Pruning	5
7. Weed Control	6
8. Nutrient Management	6
9. Fruit Thinning	6
10. Irrigation	7
11. Pests and Diseases	7
11.1 Pests	
11.1.1. Indian Gypsy Moth	
11.1.2. Peach Stem Borer	
11.1.3. Apricot Chalcid	
11.2 Diseases	
11.2.1. Brown Rot	
11.2.2. Bacterial Canker and Gummosis	
11.2.3. Powdery Mildew	
11.2.4. Wilt	
12. Harvesting and Yield	9
13. Composition of fruit and kernel	9
14. Traditional Method of Oil Extraction	10
15. Utilization	11
16. Income and Expenditure particulars	11

WILD APRICOT

The wild apricot (*Prunus armeniaca* Linn.) is an important tree borne oilseed of mid hills and dry temperate regions of the country. Wild apricot belong to the family *Rosaceae* and sub-family *Prunoidea*. In the Himalayan region of the country, local communities known it by different vernacular names viz. “*Chulli*”, “*Shara*”, “*Khurmani*”, “*Chulu*”, “*Aaroo*” *Zardhi, Khubani, Chuari, Kushmiaru, Chola and Gurdulu*. In Punjabi, it is called as *Hari, Sari and Chuli*.

1. Origin and Distribution

The cultivated apricot has its origin in North-Eastern China, whereas, wild apricot appears to be indigenous to India. Wild apricot locally called **Chullu** is found in the dry temperate regions of North-Western Himalayas particularly in the valleys of Jammu & Kashmir (especially Ladakh), Chenab; Kullu and Shimla regions of H.P. and Garhwal hills of Uttarakhand at altitudes up to 3000 m. In Kumaon region, wild apricot is found in all the three districts of Nainital, Almora and Pithoragarh. Pithoragarh district has maximum density of wild apricot tree in the Kumaon region.

2. Soil and Climate

Wild apricot is quite hardy and can be grown in most of the soils, which are deep and well drained. The horizontal and vertical root distribution of a ten year old tree reached 4.5 and 2.2 metre, respectively indicating that the soil for wild apricot should be about 3 m deep. The tree growing in wet soil can depress physiological activity of leaves and overall the growth of the plant. In Kinnaur district of Himachal



Pradesh where it is grown in large area, the soils are sandy, well drained

but not very fertile. The pH of the soil should be 6.0-6.8. Wild apricot thrives best in mid hills at elevations of 1200-3000 m above mean sea level. The long cool winter (800 chilling hours below 7°C), and frost-free and warm spring are favorable for fruiting. Average summer temperature (16.6°C–32.3°C) is suitable for better growth and quality fruit production. The sites located in north-eastern India at lower elevations and on south-western at higher elevations are also suitable for its cultivations. Spring frost causes extensive damage to the blossoms, which are killed when temperature falls below 4°C. An annual rainfall of about 100 cm well distributed throughout the season is good for its normal growth and fruiting.

3. Description

The wild apricot tree is about 10-15 m tall with a reddish brown bark. Leaves are ovate to round, approximately 5-9 cm long. Its somatic chromosome number is (2n) 16 and basic chromosome number (X), is 8. Flowers are solitary, white or pinkish, about 2.5 cm across, borne singly and appearing much in advance of the foliage. Fruits are around 1.5-4.0 cm across or more and hairy when young but nearly smooth skinned at maturity. The appearances of the fruits are yellowish with light red cheek and nearly glabrous. The flesh is yellow or yellowish orange to firm and sweet. Stone is smooth with a thickened furrowed edge.

4. Propagation

Wild apricot is mostly propagated through seeds and rarely by vegetative method such as grafting and budding. The multiplication through cuttings is also rarely done. The wild apricot seedlings are used for root stock purpose for commercial/cultivated apricot.



4.1 Seed propagation

Wild apricot seeds require cold stratification at 4-7°C for a period of 72 hours for better germination. The growth inhibitory activity of the seed-coat disappears with continuous cold treatment and accumulation of growth promoters occurs. The stratification medium should have proper moisture retaining capacity and good aeration. The seed should be kept moist during the period of stratification. The germination of seed can be hastened by removal of shell from kernel after stratification. Stratification and gibberellic acid/kinetin treatment of the seed also hasten the germination. The seeds are soaked for 24 hours in 500 ppm GA₃ or 5 ppm kinetin solution before sowing.

4.2 Vegetative propagation

4.2.1. Stem cuttings

Wild apricot can be propagated through hard wood cuttings. Cuttings can be collected in the month of December. Cuttings should be of pencil thickness and at least 10-15 cm long. Lower end of the cutting is dipped in 2500-5000 ppm IBA solution before placing the cuttings in the propagation media. Cuttings should be kept at an angle of 45-60° in the nursery beds so as to ease the rooting.



4.2.2. Grafting



Tongue grafting or whip grafting is the most successful method for propagating the elites. In this method, the cuts are made at the top of the root stock, should be exactly the same as those made at the bottom of the scion. By using a sharp knife, first a smooth sloping cut of 2.5 to 5 cm (1 to 2 inch) long is made. The longer cuts are made when working with large material. This first cut should be made preferably with one single stroke of the knife, so as to leave a smooth, flat surface. On each of these cut surfaces, a reverse cut is made. It is started downward at a point about one-third of the distance from the tip and should be about one-half the length of the first cut. To obtain a smooth-fitting graft, its second cut should not just split the grain of the wood but should follow along under the first cut, tending to parallel it. The stock and scion are then inserted into each other, with the tongues interlocking. The use of scions larger than the stock should always be avoided. However, if the scion is thinner than the stock, it should be set at one side of the stock so that the cambium layers will be certain to match along that side.

5. Planting Operation



Wild apricot is planted during the dormant season (December-end to mid-March), but early planting gives better establishment of plants. Pits of 1 m x 1m x 1m size are dug about a month before planting. They are filled with a mixture of soil and 50-60 kg. well-decomposed farmyard manure. About one kg single super phosphate and 10 ml Chloropyrophos solution (10 ml/10

litres of water) is also added to each pit. On flat land, a regular layout system such as square or rectangular is followed while on the hill slopes, contour system is generally practiced. The spacing of plants varies with the soil, climate and vigour of cultivar. The plants are generally planted at a distance of 6m x 6m. High-density planting is still to be standardized with proper



training and pruning system, and with the use of growth retardants. One-year-old, healthy and disease-free plants are planted in the middle of the pit. The soil is pressed gently so that roots are set. Watering should be done immediately to establish close contact between roots and soil. After planting, tree basin is mulched with 10 cm thick hay mulch to conserve soil moisture. In summer, watering should be done as and when required.

6. Training and pruning

Wild apricot plants are usually not trained and are allowed to grow in natural manner in initial years. Once tree grows older, the excess growth of branches is pruned for renewal of growth and spurs. Training in first dormant season, 3-5 primary scaffold branches arising at proper angles of 45-60°, well-spaced (10-15 cm apart) and spirally arranged around the tree trunk are selected. The lowest branch should be 40-45 cm above the ground level. All the primary scaffold branches are headed back to half of their growth to get the secondary scaffold branches on them. During second dormant pruning, 5-7 well-spaced secondary scaffold branches are selected on each primary branch and others are removed. At the end of third year, pruning is confined to the thinning of branches, which are, either over crowding or crossing each other, for proper development of the framework and to admit adequate sunlight and air in the tree canopy.

The production of young growth is essential for the initiation of new spurs which generally taken place at the base of the growing laterals. In young bearing trees, pruning should be light and corrective type but in older trees, heavy pruning should be done to maintain balance between

growth and fruiting. In wild apricot, 25-30% thinning of one-year-old shoots or one-third heading back is recommended to improve fruit size and quality. After pruning Chaubattia paste is applied on the cut ends of the shoots.

7. Weed Control

Since most of wild apricot plantations are scattered and are on marginal lands, so weed control is normally not practiced and trees are allowed to grow in sod culture. However, the use of chemical herbicides has been tried successfully. Simazine or diuron each @ 4-6 kg. per hectare as pre-emergence herbicides give good control of emerging weeds for 90 days.

8. Nutrient Management

Wild apricot plantations are not fertilized chemically by the farmers. Only well rotten FYM is applied to the trees. For obtaining the better flowering and fruiting, FYM @ 40-50 kg should be applied to a well-grown wild apricot tree. Pre-leaf-fall spray of 2.5-5.0 per cent urea and 0.1 percent boric acid spray after petal fall also improve the flowering and fruiting of the tree. Wild apricot is sensitive to boron deficiency, which affects the flowers and fruits. Spray of 0.1 percent boric acid (1g/liter water) after petal fall is given to overcome boron deficiency.

9. Fruit Thinning

Fruit thinning can improve fruit size, promotes regular bearing, decreases limb breakage (due to heavy crop load) and maintains the tree vigour. Fruit thinning should be done within 40 days after full bloom (last week of April or first week of May). Both hand and chemical thinning methods are employed. Depending upon the crop load, the fruit may be thinned till the fruits are 6-10 cm apart. A spur should not



have more than 2 fruits. Foliar spraying of 25-50 ppm NAA after 20 days of fruit set is ideal for thinning.

10. Irrigation

Wild apricot trees are usually grown under rain fed conditions. Being a hardy plant and tolerant to dry atmosphere, no additional irrigation is required by the trees. But application of irrigation water during the dry spell of summer months facilitate the establishment of the young plants and improves the flowering and fruiting of the well grown trees.

11. Pests and Diseases

11.1 Pests

11.1.1. Indian Gypsy Moth (*Lymantria obfuscata*)

This destructive pest has been recorded in all wild apricot growing regions. The damage is caused by caterpillar which are gregarious and nocturnal in habit. In case of severe attack the trees are completely defoliated as the larvae eat up the entire lamina, leaving the hard veins behind. Spray carbaryl @ 0.1% about a month before the anticipated date of harvest.

11.1.2. Peach Stem Borer (*Sphenoptero lafertel*)

It is a polyphagous pest attacking trunk and branches of the tree. Sometimes the entire tree dries up due to boring of grubs into trunk. Infested inner bark becomes a powdery mass like sawdust which, mixed with frass, oozes out from the splits on the surface. The adult beetles should be killed by spraying 0.15% **BHC** in the month of March and it should be repeated after a fortnight again.

11.1.3. Apricot Chalcid (*Eurytoma samsonavi*)

This is a serious pest of wild apricot. Eggs are laid inside the tender fruits. On hatching, the grub feeds inside the kernel causing drop of premature fruits. Grubs, which are translucent white, feed during April-May and remain quiescent from June to February. Thereafter, they pupate inside the fruits. All the infested and fallen fruits should be collected and destroyed to control this pest.

11.2 Diseases

11.2.1. Brown Rot (*Monilinia laxa*)

The disease attacks wild apricot in all the countries. It is positively related to the rainfall in the first 7 days after flowering begins. Both blossoms and fruits are affected. In case of severe infection, blossoms turn brown and die. After infection, tiny brown spot enlarges to a large, soft, brown area within a few days. The pathogens live all over winter in fruit mummies, in twig cankers and in rotten fruits. Spraying of 0.1% benomyl during anthesis or 1% DNOC during dormant season effectively controls this disease.

11.2.2. Bacterial Canker and Gummosis (*Pseudomonas sp.*)

The disease has a worldwide spread, attacking many other stone fruits besides wild apricot. Except root, all the other parts of the trees are attacked. The bark and outer sapwood show symptoms of circular to elongated water-soaked lesions. The affected bark later turns brown, gummy and sour-smelling. Sunken black lesions are found on the infected fruits. Bordeaux mixture spray (4:4:50) in the fall and spring prevent the infection and found effective in controlling the disease.

11.2.3. Powdery Mildew (*Sphaerothra pannosa*)

The fungus infects young leaves and shoots while the older ones are fairly resistant. The white, powdery appearance is caused by large number of conidia produced in chains arising from the wefts of hyphae on the leaf surface. The infected young leaves get curled and narrowed as they expand. The disease checks the growth of the affected plant parts. Three sprays of 2% wettable sulphur at different stages, i.e., before flowering, at petal fall and two weeks thereafter, are necessary to control the mildew.

11.2.4. Wilt

The leaves drop down from the affected limbs in early summer. The whole tree or a part of it may be affected. No external evidence of the disease except general stunting is visible. Its control through protective sprays is not possible. Before new planting, the pit soil should be sterilized with formalin.

12. Harvesting and Yield

Wild apricot fruits generally start maturing from last week of May and continue upto August end depending upon altitude and location. They are harvested manually by shaking the tree branches and no mechanical harvesting is practiced. Change of surface colour, days from full bloom to harvesting and fruit total sugar solids (TSS) are considered as the best indices of maturity.

For fresh marketing, fruits should be plucked when they change their surface colour from green to yellow. Fully ripe fruits are harvested for freezing, canning and drying. The fruits should be harvested in morning hours and direct exposure of fruits to sun should be avoided during grading and packaging. Tree starts bearing at the age of 4-5 years and continues to bear well for 50-



60 years. The full bearing occurs at about 10-15 years when it yields about 85-100 kg. fruits per tree. The stone yield varies from 12-17 percent of fruits and the kernel yield ranges 3.14-4.81 kg/tree. The yield of a full-bearing well maintained tree varies from 120-150 kg.

13. Composition of Fruit and Kernel

Apricot is a good source of sugars and Vitamin A and contains appreciable amounts of thiamine and iron. Fresh wild apricots yield 86 percent of edible matter, which contain following elements:

Ripe fruit pulp contains

Total solids	12.4-16.7 percent
Insoluble solids	2.1-3.1 percent
Acids (as malic acid)	0.7-2.2 percent
Total sugars (as invert sugar)	5.3-8.6 percent

Glucose	3.2-4.8 percent
Fructose	1.4-4.25 percent
Sucrose	1.4-5.4 percent
Tannin	0.06-0.10 percent

The wild apricot fruits yield 22-38 percent kernels, which may be sweet or bitter depending on the type. Sweet kernels resemble almonds in taste and are used as its substitute in pastes and confectionery and can be added to apricot jams. The kernels contains Water (4.3 %), Protein (31.4 %), Oil (53.4 %), Fiber (4.8 %), Ash (2.6 %) Sugar direct (8.1 %) & as dextrose after conversion (11.6 %)

Kernel oil closely resembles expressed almond oil thus it is employed as an adulterant or a substitute for almond oil. The cake after extraction of oil contains Nitrogen (6.64%), Phosphoric acid (2.2 %), Potash (1.14%)

An essential oil that is identical with bitter almond oil is distilled from the cake. Apricot kernels are cheaper and give higher yield of oil (0.8 – 1.6 percent) than bitter almond oil. The seed cake of the bitter apricot yields 1.6 percent of the oil. The cake from which the oil has been removed is free of hydrocyanic acid and can be used as a feed stuff for livestock.

14. Traditional Method of Oil Extraction

For the extraction of oil, the seeds are manually broken to avoid shooting of the seeds, cords made of Bhimal are made into a loop, the seeds are kept inside it and broken manually by small round stones found in the river bed. The kernels thus extracted are dried in the sun. They are then crushed to a fine paste in a mortar, known as the ‘Okhali’ locally. The paste is then kneaded by dipping hands in warm water under the sun. With this process, the paste exudes the oil. This paste is then put in a wooden vessel made especially for the extraction of oil.

In the recent years power driven oil expellers have been set up near the road sides by some farmers for business. But mostly the farmers near the road sides or at close distances of 1 to 3 km. are benefited from them, but in the hills most of the villages are at considerable distances from the roads, where the traditional system of oil extraction is the only choice.

15. Utilization

The wild apricot is unfit for table purpose due to high acids and low sugars. It is not processed for any commercial product at present although studies for preparation of sauces and chutney from this fruit have given quite encouraging results. The major portion of the crop pulp is utilized by the tribals in Himachal Pradesh and Uttarakhand for the preparation of distilled alcoholic liquor. The fruits are highly perishable and can be preserved in a number of ways. They are frozen, candied or made into a paste. In some countries, fruit pulp is cooked and thinly spread on cloth and then rolled and dried and it constitutes an important food. A number of products are prepared from fruits of apricot. Its fruits mixed with those of cultivated types are utilized in Himachal Pradesh in production of number of products like apricot jam, apricot nectar, and apricot papad. The strained baby foods from pulp is nutritious and a good source of calcium, phosphorus and iron. The oil of seed is edible and oil cake can be used as organic manure.

16. Income and Expenditure particulars

The estimated cost of cultivation and yield and returns of Wild apricot have been shown in Table-1 and Table-2.

TABLE-1. Estimation of Cost of Cultivation

Investment period	Amount (Rs. Per hectare)
Initial year	13200
1 st year	5100
2 nd year	7850
3 rd year	11100
5 th year	15550
Total investment (Establishment)	52800

Source: Dr. S. Bhan, HPKVV, Palampur

Table-2. Yield and Returns

Year/ age	Yield per tree (Kg.)				Yield per hectare (400 trees/ha.)		Returns per hectare (Rs.)		
	Fruit	Kernel	Oil	Oil cake	Oil	Oil cake	Oil	Oil cake	Total
5	20	0.74	0.39	0.35	156	140	23400	640	24040
8	55	2.03	1.08	0.95	432	380	64800	2280	67080
12	115	4.25	2.25	2.00	900	800	135000	4800	139800
15	130	4.81	2.55	2.26	1020	904	153000	5424	158424

Oil being sold @ Rs.150/kg & cake @ Rs.6/kg.

Source: Dr. S. Bhan, HPKVV, Palampur

