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# Varietal Wealth of *Prunus* Species

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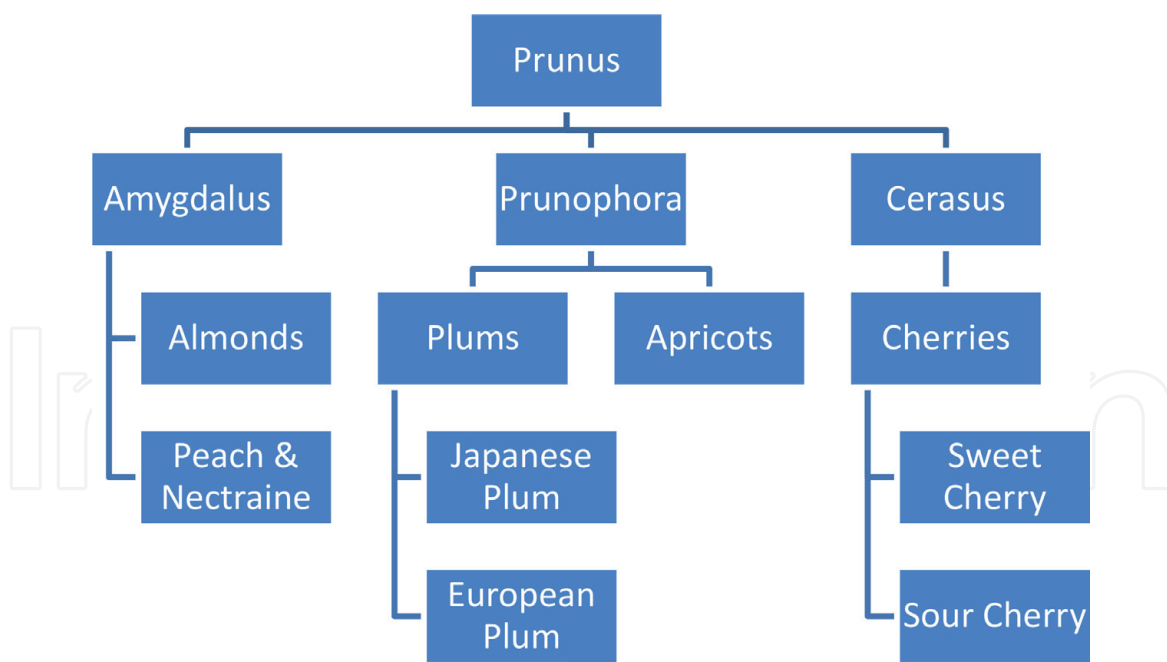
## Abstract

Genus *Prunus* includes all the stone fruits (peach, nectarine, plum, apricot, almond and cherry) comprise around 98 species and classified under three subgenera namely: *Amygdalus* (peaches, nectarine and almonds), *Prunophora* (plums and apricots) and *Cerasus* (cherries). Genus *Prunus* have attained a prime position among all the temperate fruit crops as delicious edible drupe, and many species have ornamental values as well. Major species of importance are *Prunus persica* (peach), *Prunus armeniaca* (apricot), *Prunus salicina* (Japanese plum), *Prunus domestica* (European plum), *Prunus americana* (American plum), *Prunus avium* (Sweet cherry), *Prunus cerasus* (Sour cherry), *Prunus dulcis* (almond), *Prunus ceracifera* (Cherry plum), *Prunus mira* (Behmi), *Prunus cerasoides* (Wild Himalayan cherry), *Prunus mahaleb* (Mahaleb cherry) etc. Interspecific hybrids namely: plumcots, pluots and apriums also produce very delicious edible fruits. Commercial cultivars of different stone fruits are J H Hale, Cresthaven, Flordasun, Florda Prince, Elberta, Glohaven, July Elberta, Redhaven, Kanto 5, Sun Haven etc. of peaches, Fantasia, Mayfire, Red Gold, Snow Queen etc. belongs to nectarine, Turkey, Charmagz, Perfection, St. Ambroise, Royal, New Castle etc. are apricots, Santa Rosa, Black Beauty, Kelsey, Green Gage, Methley, Satsuma, Frontier, Burbank etc. are plums, Regina, Burlat, Lapins, Kordia, Stella, Bing, Van, Black Heart, Compact Lambert, Compact Stella etc. are cherries, and California Paper Shell, IXL, Mission, Nonpareil, Drake, Ne Plus Ultra, Pranyaj, Merced etc. are almonds.

**Keywords:** *Prunus*, varieties, stone fruits, peach, cherry, almond

## 1. Introduction

Stone fruit is a generic term used to define fruits which includes peach, nectarine, plum, apricot, almond and cherry which are generally grown in temperate climatic conditions. The main feature of stone fruit is having fleshy layer, mesocarp, as edible pulp surrounding a relatively large, hard pit commonly known as 'stone' that shields and protects a seed. The commercial production of stone fruits is confined between the latitude of 30 and 40°N and S, although it is now grown almost all over the world. The major stone fruit-producing country is China accounting about 50 per cent share of the total world production. In India, stone fruits are grown on a commercial scale in mid-hill Himalayan states, viz. Himachal Pradesh, Jammu and Kashmir, Uttarakhand, as well as in a limited scale in north-eastern states. These fruits are generally grown on soils having bulk density, parasitic nematodes, root rot problems, fungal pathogens or other soil and replant problems.



**Figure 1.**  
*Botanical classification of Prunus genera showing various stone fruit crops.*

There are over 400 to 430 species in the genus *Prunus*, (includes edible as well as ornamentals fruit crops) but only 89 are listed in the Genetic Resource Information System [1, 2]. In India, about 36 *Prunus* species have been reported so far and 18 species are useful for cultivation for different purposes [2–4] (Figure 1).

## 2. Almond

Almond is classified in the subgenus *Amygdalus* within the genus *Prunus*, distinguished from the other subgenera (*Prunophora* and *Cerasus* sections) by the corrugated seed shell [5]. Twenty two almond species were classified into five taxonomic sections including: *Euamygdalus*, *Spartioides*, *Lycioides*, *Chameamygdalus* and *Leptopus* [6]. Being a temperate crop, almost all the varieties of almond can be grown successfully in the temperate regions of India. However, most promising cultivars which have been tried or being cultivated in various parts of the world are described here under.

### 2.1 Blanquerna

It is derived from self-pollinating ‘Genco’, self-compatible almond cultivars developed at Zaragoza, Spain [7]. The cultivar do not requires any foreign intervention for their proper pollination and consequently for the production of a commercial crop. In addition, kernels from these new cultivars show no doubles.

### 2.2 Butte

California and Mission type cultivar, harvested 25–30 days after Nonpareil. Shell is semi-hard without suture opening, excellent crop potential. Nut and kernel size is small, short, wide in shape with wrinkled surface. The plants are spreading in nature, a late bloomer variety and suitable pollinizers for Mission.

### **2.3 California Paper Shell**

Tree is erect which is suitable for high density plantations. It bears flower and nuts on both spurs as well as on long shoots. Regular bearer, blooms in mid March and ready to harvest after 152 days from the date of full bloom. Nut and kernel are longer in shape with extra light color. Thin shelled, yielding 50 shelling percentage.

### **2.4 Cambra**

This variety is derived from a cross between 'Tuono' and 'Ferragnes', self-compatible almond cultivars developed at Zaragoza, Spain [7]. The cultivar do not requires any foreign intervention for their proper pollination and consequently for the production of a commercial crop. In addition, kernels from these new cultivars show no doubles.

### **2.5 Carmel**

California type cultivar, harvested 25–30 days after Nonpareil. Shell is soft, good shell integrity and fair suture opening. Nut medium in size, narrow in shape with slightly wrinkled surface and long attractive kernel. The plants are medium upright in habit, late in harvesting and a good pollinizer for Nonpareil variety.

### **2.6 Drake**

A soft-shelled cultivar which yields medium-sized nuts of good shape and color. Nut shape is oblong with the tip rounded or slightly tapering and the shell is whitish or light brown in color. Cultivar shows irregular bearing and is susceptible to brown rot disease.

### **2.7 Felisi**

This variety is originated from a cross between 'Titan' and 'Tuono', self-compatible almond cultivars developed at Zaragoza, Spain [7]. The cultivars do not requires any foreign intervention for their proper pollination and consequently for the production of commercial crop. In addition, kernels from these new cultivars show no doubles.

### **2.8 Fritz**

California and Mission type, harvested 40–60 days after Nonpareil. Semi-hard shell, light in color. Nuts are small, medium plump in shape, dark brown in color with wrinkled surface. The tree has upright vigorous tree, good cropper, a good pollinizer for Nonpareil variety, but susceptibility to bacterial spot.

### **2.9 Himachal selection no. 10**

This cultivar has been selected from Himachal Pradesh, India. The tree is medium vigorous and spreading growth habit. The nut is medium in size, elongated in shape and brown in color. Kernel weight is about 78 per cent of the nut weight.

### **2.10 Hybrid no. 15**

This hybrid has been released from Punjab Agricultural University, Ludhiana. The tree is spreading type. The nuts are uniform in size and are elongated. The

kernel is dark brown in color. The taste and flavor of this variety is poor. The kernel weight is 51 per cent of the nut weight.

### **2.11 IXL**

A regular bearing cultivar, blooms towards end March and ready to harvest after 151 days from the date of full bloom. The tree is spreading type and of intermediate vigor. It bears on both spurs as well as on long shoots with good ability to renew fruiting wood. The nut and kernels are medium and shell color intensity is intermediate. Shells are soft that gives a high shelling percentage of about 55 per cent. It gives good yield in the foot-hills and valley areas but is incompatible with Nonpareil and should, therefore, not be planted with it. It is susceptible to gum-mosis disease.

### **2.12 Makhdoom**

A regular bearer cultivar, bloom during 1st week of March and ready to harvest after 141 days from the date of full bloom. The tree is spreading/drooping in growth habit. It bears flowers on long shoots and spurs with good ability to renew fruiting wood. The shell color is medium, soft type plump which yields about 42 shelling percentage. The average productivity is more than 2.0 t/ha.

### **2.13 Marcona**

A Spanish variety with a small, precocious habit. The shells are hard, making the nuts more difficult to shell, resulting in a weaker meat to shell ratio. However, Marcona meats are generally worth 20 per cent more per pound than Nonpareil. Good compatibility with Sonora.

### **2.14 Merced**

A regular cultivar, blooms during 3rd week of March and ready to harvest after 152 days from the date of full bloom. The tree is upright which is suitable for high density plantations. It bears on both spurs as well as on long shoots with good ability to renew fruiting wood. Shell color is intermediate with papery shell giving shelling percentage of about 56 per cent. The variety is also suitable for export of kernels. The average productivity is 2.0 t/ha.

### **2.15 Mission**

This cultivar is harvested 40–60 days after Nonpareil. It is a hard shelled without suture, opening. Nut are small, short wide in shape and dark brown in color with deep wrinkled surface. Medium small but plump kernel but unsuited to blanching. It is a late bloomer variety so resistant to frost.

### **2.16 Monterey**

It is a California type cultivar, harvested 40–60 days after Nonpareil. It is soft shell variety, exhibits high percentage of double kernels, which are large in size, kernel brown in color with smooth surface. Nut is large in size, long narrow in shape and surface is deep wrinkled. Very good crop potential and late harvester.

## **2.17 Ne Plus Ultra**

A popular cultivar for big sized nuts and have attractive shell. Plants are somewhat small with spreading branches, good cropper, a good pollinizer for Nonpareil. The kernel are large with many doubles, becomes defective when the moisture is lacking and the nuts are frequently gummy when the soil becomes slightly water-logged. It is soft shell, earlier bloomer. The plants are susceptible to some diseases.

## **2.18 Nonpareil**

An early and one of the most important and best commercial cultivar of almond with soft shell which is brown in color. Nuts are medium in size, flat in shape, light in color and have smooth surface. Shell is papery with high kernel to the nut ratio fetching high price. Nuts are elongated in shape, flattened and pointed at the apical end. The shell is white and the kernel is flat, light brown, sweet with good flavor. This variety grows well in Punjab and Himachal Pradesh. It bears on both spurs as well as on long shoots having good ability to renew fruiting wood and is relatively resistant to frost. Nuts have an extra light color, papery shell which yields high shelling percentage upto 60 per cent.

## **2.19 Padre**

Hard shelled, good consistent cropper, California and Mission type cultivar, harvested 25–30 days after Nonpareil and similar to Butte. Nut and kernel is small to medium in size, short and wide in shape, dark brown in color with wrinkled surface.

## **2.20 Parbat**

The tree is regular bearer which blooms in the 3rd week of March. Fruits are born on one year shoots a some on spurs. Nut size small, shell color whitish yellow, matures at 140 days after bloom. Kernels are smooth having good color and very good appearances and taste, shelling percentages on an average 49 per cent. The average yield (in shell) is around 0.5–1.0 t/ha under normal conditions.

## **2.21 Peerless**

Hard shell type cultivar, blooms early in the season and susceptible to frost, harvested 7–10 days after Nonpareil. Shell is hard, light in color and surface is smooth. Nuts are medium in size, wide in shape with fairly wrinkled surface. It is a best pollinizer variety for Nonpareil.

## **2.22 Pranyaj**

This is a regular bearer cultivar which blooms during mid-March and ready to harvest after 144 days from the date of full bloom. The tree growth habit is upright and is suitable to grow under high density orcharding. Bears on long shoots and spurs. Shell color is light, shell is soft. Nuts are medium in size, kernels are plump and yields shelling percentage of about 44 per cent. The average productivity is more than 2.0 t/ha.



### **2.23 Price**

It is good cropper cultivar but tends to be biennial, California type cultivar, harvested 7–10 days after Nonpareil. High percentages of double kernels are produced. Shell is papery, dark brown in color, surface is rough. Nuts are small to medium in size, short narrow in shape with fairly wrinkled surface, tends to form in clusters. It is a best pollinizer variety for Nonpareil.

### **2.24 Primorskij**

Trees are spreading and moderately vigorous, mid to late blooming, nuts are medium to large, bold, slightly flattened and brown in color, kernel medium to large. Soft paper shelled and late season maturity.

### **2.25 Shalimar**

A regular bearer cultivar, blooms in mid March and ready to harvest after 143 days from the date of full bloom. The tree growth habit is spreading/drooping type. It bears flowers on both long shoot and spurs with good ability to renew fruiting wood. The shell is light in color, papery type and yields shelling percentage of about 50 per cent. This variety is suitable for export. The average productivity is 2.0 t/ha.

### **2.26 Sonora**

California type cultivar, harvested 7–10 days after Nonpareil. Shell is papery, dark brown in color and surface is rough. Nuts and kernels are medium to large in size, long narrow in shape, light in color with smooth surface. It is a heavy bearer variety which tends to biennial bearing.

### **2.27 Texas**

It is a late ripening variety and yields regularly. The kernel tastes slightly bitter. The nut is small and poor in appearance.

### **2.28 Thin shelled**

An early and regular bearing cultivar. Tree is very vigorous, upright and with a fairly dense head. The nut is light brown in color, attractive and smooth. The shell is very thin and papery. The kernel is brown, well developed, sweet and delicious.

### **2.29 Waris**

The variety is a regular bearer, blooms during mid-March and ready to harvest after 145 days from the date of full bloom. The tree growth habit is upright and is suitable for high density orcharding. It bears fruit on long shoots and spurs. The shell color is medium, soft shelled, nut are medium in size, soft shelled with plump kernels with upto 48 shelling percentage. The average productivity is more than 2.0 t/ha.

### **2.30 Belona and Soleta**

These are two new almond (*P. amygdalus* [*P. dulcis*]) cultivars from Zaragoza, Spain. Both cultivars were obtained from artificial pollinations following the steps

of a traditional breeding programme. Both came from the cross made in 1988 of Selection E-5-7 (seedling of open-pollinated 'Genco', a self-compatible Italian cultivar) by the French cultivar 'Belle d' Aurons', characterized by its kernels of excellent quality. This cross was made with the aim of utilizing a self-compatibility source other than 'Tuono', so far the mostly utilized parent in almond crosses [8].

### 3. Apricot

According to different apricot classifications, reported by Lingdi and Bartholomew [9], there are 11 accepted apricot species within the section *Armeniaca* including *P. brigantina* Vill. (alpine apricot), *P. mandshurica* Maxim. (Manchurian apricot), *P. sibirica* L. (Siberian apricot), *P. armeniaca* L. (common apricot), *P. mume* Sieb & Zucc. (Japanese apricot), *P. dasycarpa* Ehrh. (black apricot, a natural plum-apricot hybrid), *P. holosericea* Batal. (Tibetan apricot), *P. hongpingensis* Li., *P. zhengheensis* Zhang & Lu., and *P. hypotrichodes* Cardot. Also, the desert apricot (*P. fremontii* S. Wats.), originated from southern California deserts, is worth mentioning among the listed species, can be freely hybridized with them, and has close morphological traits to other species of apricot [10]. All the Apricot varieties in the Mediterranean region and USA are of European group and have very little genetic diversity [11]. The European group of Apricots is the youngest in origin and Dzhugar Zailij (Soviet Central Asia such as Kazakhstan) is the oldest. The varieties belonging to European group are self-compatible. Majority of the varieties of Central Asian, North African, Near East and Caucasian origin are self-incompatible [12]. Around one hundred thirty one cultivars and thirteen rootstocks have been reported in USA [13]. The description of major apricot varieties is described here.

#### 3.1 High chilling apricot varieties

##### 3.1.1 Australian

It is an introduction and grown in cold desert area in India. Fruit round, very large, medium sweet, freestone, sweet kernel and suitable for processing and not like for table purpose. Matures in end July to end August. Shelling and kernel percentage are 72 per cent and 28 per cent, respectively.

##### 3.1.2 Bergeron

It is a late apricot, found from the beginning of August in the Northern Hemisphere, original from the valley of Rhone in France. It is suitable both for fresh consumption as for processing. The cultivar has flowering duration of 7 days. The tree at the age of 4 years 15–16 kg fruits on an average. The fruit weight 51.0 g almost the size of Pinkcot but with little bigger stone (3.43 g). Fruits are large with orange-yellow skin, with some red traces. Flesh is juicy and delicious. The fruit is sweet with a TSS/acid ratio of 10.7 [14].

##### 3.1.3 Charmagz

A self-incompatible cultivar which requires pollination with varieties like Turkey. Skin straw yellow, light yellow flesh which is very sweet. Fruit is medium in size; roundish flat in shape; kernel is sweet. Suitable for dessert and drying purposes. It is widely grown in high hills of Himachal Pradesh and also in cold deserts.



#### *3.1.4 CITH Apricot-1*

It is self-sterile and mid-season blooming type variety. Fruits are very large (79.0 g), round, symmetrical with smooth distal end, yellowish-orange colored with reddish coloration on one side (25–30%), low acidity, high TSS (14°Brix), early maturing and good quality, consume as table purpose and suitable for processing. Tolerant to major pests and diseases. The plant yields around 15–20 tons/ha. This variety can be grown under entire temperate region of North Western Himalayan agro-ecological zones [15].

#### *3.1.5 CITH Apricot-2*

This variety is self-fertile and early to mid-season blooming type. Fruits are very large (80.0 g) oblate, asymmetrical with slightly pointed beak, yellowish orange with reddish on exposed surface, low in acid, high TSS (14°Brix) and high yielding (12–15 tons/ha) early maturing, superior quality having and widely acceptability by growers and consumers. The plants are tolerant to leaf curl and stigma blight. Used for table and processing purpose. This variety can be grown under entire temperate region of North Western Himalayan agro-ecological zones [15].

#### *3.1.6 CITH Apricot-3*

This variety is self-fertile and early to mid-season blooming type. Fruits are very attractive in color, 30 to 40 per cent area of fruit with orange back ground, fruit medium (74.0 g), obtate, symmetrical with slightly pointed beak, yellowish orange with very little reddish tinge, low in acid, high TSS (16°Brix), early-mid season maturing and good quality. Fruit yields upto 10–12 tons/ha. Tolerant to major pests and diseases. This variety can be grown under entire temperate region of North Western Himalayan agro-ecological zones [15].

#### *3.1.7 Dora*

The plants are upright in nature and self-compatible. Blooming in the first fortnight of March and harvests in the last week of May. Fruits are 45.58 g in weight, peel color was intense yellow. In ripe fruits 11.0°B TSS was observed [16].

#### *3.1.8 Early Shipley*

Fruits are creamy white and medium in size. Flesh sweet and juicy, kernel is bitter in taste. Fruit matures in mid-May.

#### *3.1.9 Ema*

It is suitable for mid hills of Himachal Pradesh. The fruit is round, medium in size, yellow orange in color, sweet and mature in end May to first week of June (10–15 days before New Castle).

#### *3.1.10 Halman*

An important dessert cultivar of cold arid zone of India especially, Ladakh region of Jammu and Kashmir. The name 'Halman' means grafted in Tibetan language. Spreading and vigorous tree habit, fruits are orange red in color; round, small in size (around 13.0 g) with compressed pedicle end, free stone. Fruit not so juicy and

matures in early August. The fruit is primarily used for drying as fruit has less juice with high TSS (15.8°Brix) and 4190 mg per kg potassium [17]. It has the highest TSS in all the cultivated varieties of apricot and the sweet kernel is also eaten. Shelling and kernel percentage is 72 per cent and 28 per cent, respectively [18].

#### *3.1.11 Hamidi*

This variety comes from Tunisia but it is now-a-days cultivated in Greece. It is available in the markets from the end of May, beginning of June. It is pale yellow, it has a very pleasant aroma, although the pulp is not very juicy.

#### *3.1.12 Harcot*

It is suitable for mid hills of Himachal Pradesh. Trees are upright to spreading and vigorous. Fruits are medium to large with roundish heart shape. Fruits with yellow orange skin color, pink to red blush, sweet kernel. It is resistant to leaf spot, fruit spot and fire blight. Fruit matures in mid-June.

#### *3.1.13 Imola Royal*

It is one of the most important Italian varieties. Because of the firmness of its flesh, it is very appropriate for the industry. It is available in June and July, coming not only from Italy, but also from Spain and Israel. It is asymmetrical, large, elongate, orange-yellow with some pink traces where it has been touched by the sun. The pulp is also yellow orange and its juice is sweet with a remarkable aroma.

#### *3.1.14 Kaisha*

The trees are vigorous and spreading, medium sized, Fruit yellow in color with a red blush. Fruits are roundish flattened shape with prominent suture and medium in size. Flesh orange yellow in color, sweet and delicious. Matures in early June, high yielding variety with bitter kernel.

#### *3.1.15 Moongold*

The fruit is soft golden colored and of medium size. The fruit is attractive with orange yellow flesh, firm and sweet with excellent flavor and is good for eating fresh or making preserves. Early to mid-season variety.

#### *3.1.16 Moorpark*

Fruits are orange in color with a red blush. Fruits are round and large. Flesh juicy, sweet and excellent in flavor. A mid-season variety which matures in first week of June but, shy bearer.

#### *3.1.17 Nari*

It is an exotic cultivar and grown in India. Fruits skin pale yellow. Fruits were small, oblong and depressed at ends. Flesh light yellow color and slightly fibrous. Fruits have sweet aroma; free stone and kernel is sweet. It is a late variety and matures in end May to first fortnight of June in high hills and after mid-August in dry temperate areas. Dual purpose variety suitable for table as well as drying purpose.

### *3.1.18 Nella*

The plants are upright in nature and self-compatible. Blooming starts in the end of February and ends in the second half of March month and harvests in the last week of May. Fruits are 42.44 g in weight with 40–50 per cent reddish area. In ripe fruits 11.3°B TSS was observed [16].

### *3.1.19 New Castle*

A popular cultivar commonly grown in the mid hills of Himachal Pradesh. Trees are vigorous and spreading, Fruits are yellow in color, round and medium in size. Used as fresh fruit and for drying; kernel is sweet. It is an early maturing cultivar and fruit matures in May [19].

### *3.1.20 Nugget*

Regular bearing and self-fruitful cultivar with good quality fruit. Fruit skin deep orange with vermillion blush. Fruits are round in shape, medium to large. The flesh is fine textured, deep yellow, firm and juicy. The flesh and kernel is sweet. It ripens in the end of May or first week of June.

### *3.1.21 Perfection*

Traditionally, this variety has been produced both in Washington and California. A mid-to late season variety that is oval, oblong in shape with excellent flavor. The fruit has orange skin and flesh and is somewhat flattened, but usually with equal halves. Skin is pebbly. Fruit is relatively large with 6.4 diameter, medium suture and small pit. Flavor and quality are good for both fresh marketing and processing. The variety is somewhat more acidic than other leading commercial varieties [20].

### *3.1.22 Pinkcot*

The French cultivar yields 11.0 kg fruit per plant at the age of 4 years. The fruit size is little less than Sylred with 5.5 per cent stone share. The fruit is very sweet with total soluble solids of 14.0 per cent acidity 1.12 per cent [14].

### *3.1.23 Rakchey Karpo*

Second most important dessert cultivar after Halman in Ladakh region, Jammu and Kashmir. Indigenous to Ladakh region; 'Rakchey' means stone and 'Karpo' means white hence, the name symbolizes apricots with white stones which is generally uncommon [18]. The fruits are medium to large in size (18.7 g) with high TSS (19.6°B) and 4800 mg per kg potassium [17]. Early maturing matures in end July to early August. Fruits pale yellow with red blush, light pale pulp, juicy, sweet and mild acidic with pleasant flavor, freestone with sweet kernel, shelling is 68 per cent and kernel 32 per cent. Kernels are used for oil extraction. Matures in August month in Ladakh region.

### *3.1.24 Rogan*

An early table purpose variety grown in Leh district which matures in early July. Fruits are glossy skin straw yellow, smallest in cultivated apricot varieties, round in

shape, very soft, juicy and slightly acidic, freestone, with small stone, kernel sweet. Shelling and kernel percentage is 62 per cent and 38 per cent.

#### *3.1.25 Royal*

Fruit is yellow in color and firm. Fruits are large in size with juicy flesh. Good for dessert and canning.

#### *3.1.26 Shakarpara*

An introduction from Afghanistan and suitable for growing in Himachal Pradesh and Kashmir valley. Fruits are medium in size, round in shape, Fruit skin is creamy yellow with pinkish blush on shoulders. Flesh is pale yellow and very sweet, less acidic with good aroma. It can be used for table purposes. The kernel is bold and sweet. It ripens by the third week of May in high hills and in cold deserts matures in late July to mid-August. It is a shy bearer variety with high chilling requirements.

#### *3.1.27 St. Ambroise*

Fruit is orange yellow in color with tiny dots of pink. Fruits are oval in shape and large in size. Flesh is deep yellow, firm and sweet. Matures late in end of June to first week of July.

#### *3.1.28 Suffaida/Safaída*

An exotic cultivar and an introduction for cold deserts of India. Fruits are medium to large in size, round in shape, light yellow skin glossy, smooth and flesh very sweet, less acidic with pleasant flavor. Fruit matures in first week of June. Stone is small and kernel sweet. Shelling percentage is 72 per cent whereas kernel 28 per cent.

#### *3.1.29 Sungold*

Fruits are of medium size, colored bright colored clear gold with attractive orange blush, nearly round and tender skin. The fruit is good for eating fresh or making preserves.

#### *3.1.30 Sylred*

This is an French cultivar with an average yield of 15.6 kg/tree. The cultivar flowers during March–April with a flowering duration of 7–8 days. The fruit weighs 59.0 g with 4.52 per cent stone share. The fruit is sweet with the TSS/acid ratio of 10.0 [14].

#### *3.1.31 Tilton*

Regular in bearing, firm and good in quality. An important canning cultivars in the USA and Canada.

#### *3.1.32 Tokpopa*

A table and drying type apricot indigenous to Leh district in Ladakh region. Fruit ripe late and matures in the month of August. Fruits are dull yellow in color,

medium sized fruit, round in shape compressed with smooth skin, acidic to sweet in taste, freestone with a shelling percentage (68%) and kernel (32%).

#### *3.1.33 Turkey*

The trees are vigorous with spreading habit, fruits are medium in size and almost round shape. Fruits with deep yellow skin, brownish orange in color with dots, free stone and sweet kernel and mid-season maturity.

#### *3.1.34 Wenatchee*

Fruits are yellow with green shoulders, oblong shaped, large in size. Regular in bearing, firm and good in quality. A chance seedling and important fresh fruit variety in the USA and Canada.

#### *3.1.35 Wild apricot*

It is found in temperate regions of Western Himalayas within Himachal Pradesh and Kashmir and locally known as chulli. It is a prolific bearer in comparison to cultivated apricot and fruits are eaten fresh or sun dried. The kernel mostly tastes sweet is also eaten but, it may be bitter. The kernel contains around 50 per cent oil which is extracted and used for cooking, massage or hair oil. It flowers in second half of March and fruits ripen in May to June in high hills and latter in dry temperate region. It is widely used as a rootstock for apricot and plum in India.

### **3.2 Low chilling apricot cultivars**

#### *3.2.1 Benazir*

An introduction from Pakistan at Patiala in Punjab known as Benazir flowers and fruits profusely and ripens in the first fortnight of May.

#### *3.2.2 Chaubattia Alankar*

Hybrid between Kaisha x Charmgaz. Regular bearing, low chilling and very early maturity. Good keeping quality.

#### *3.2.3 Chaubattia Madhu*

Hybrid between Turkey x Charmgaz. Early ripening, highly productive, regular in bearing.

#### *3.2.4 Chaubattia Kesri*

Hybrid between St. Ambroise x Charmgaz. Regular bearing, mid-season, good quality fruits, mature during end May to first week of June.

## **4. Cherries**

There are over 30 species of cherries, most of which are endemic to Europe and Asia. In the subgenus *Cerasus*, *P. avium*, *P. cerasus*, *P. fruticosa*, and also *P. tomentosa*



and *P. pseudocerasus* in China and domesticates of *P. serotina* in South America are grown for their fruits [21, 22].

Sweet cherries can be divided into subgroups, based on fruit color, shape, and texture [22]. The subgroups include Geans which are heart shaped with tender flesh, black Geans which have dark-colored flesh, amber Geans which have light yellow fruit with translucent flesh and skin, Bigarreaux which has firm and cracking flesh, and Hearts which are dark in color with flesh texture between Geans and Bigarreaux.

Sour cherries have also been further categorized, based on skin and juice color and fruit shape, into either Amarells (pale red fruits with more or less fattened shape and colorless juice) or Morellos (dark red fruits with globular or cordiform shape and red to dark red in juice color) [23]. Duke cherries (with dark red skin and semiacid juice) are considered to be a hybrid between sweet and sour cherry and now classified as *P. x gondouinii* Rehd. [24].

Although there are numerous other cherry species in the *Cerasus* and *Padus* subgenera, few of these species have been used to genetically improve sweet and sour cherry scion cultivars. Most of the species and interspecific hybrids developed are used for rootstock improvement. *Prunus avium* is primarily an European species, which occurs abundantly in wild form on the forest slopes of Southern, Central and Western Europe. Pomologically, according to fruit firmness, cherry cultivars are divided into the Heart cherry group, with mainly early ripening cultivars that have a soft flesh and the Bigarreau group. Among them few have been described here under.

#### 4.1 Bada

Resistant to fruit doubling. The fruit ripens earlier than Napoleon. Blooms relatively late but overlaps with 'Bing' and 'Napoleon', serves as good pollen source for these varieties.

#### 4.2 Balaton

Originated in Hungary, as a local variety. Compared to 'Montmorency' the fruit is larger, firmer, sweeter and redder and it has a juicy flesh. The pits are slightly larger than other varieties and may cause problems for processors.

#### 4.3 Bing

It is originated in United States from an open-pollinated population of Black Republican which is the most traditional and representative cherry of America. Fruits are firm, sweet, medium to large in size, attractive black color with excellent flavor. Its dark red flesh is firm, not very fibrous, juicy, sweet and very good in quality. Bing produces an excellent canned product but is inferior for brining unless picked before fully ripe. However, its susceptibility to canker, severe fruit splitting, and sensitivity to our cold climate does not make it an ideal variety.

#### 4.4 Blackgold

A late mid-season, self-fertile, sweet cherry selection and primary use is for fresh eating. This is the latest blooming sweet cherry and has remarkable tolerance to spring frost.

#### **4.5 Black Republican**

Fruit are medium sized, good quality, dark red turning black when fully ripe. Primarily used as a pollinizer for other sweet cherries.

#### **4.6 Black Tartarian**

Fruits are small-medium in size, purplish black in color, heart shaped and good quality. The flesh is dark red, soft and juicy. Early ripening and early bearing. An excellent pollinizer for most varieties but the small, soft fruit of relatively poor quality is not commercially desirable.

#### **4.7 Cavalier**

It is a black variety which is early ripening. Fruit is medium to large, dark red and has firm flesh with good flavor. Fruits are of high quality and resistant to fruit cracking.

#### **4.8 Chelan**

This is the earliest of the fresh sweet cherries grown in the Pacific Northwest, ripening 10–12 days before ‘Bing’ or ‘Van’. Fruit size is small and similar to Bing or slightly smaller. It has a very mid-flavor but the flavor seems to be acceptable. Bing, Van, Lapins and Sweetheart cultivars are used as pollinizers. Due to its high productivity, most growers prefer Mazzard rootstock and it is incompatible on Mahaleb.

#### **4.9 Chinook**

Chinook is a cross between Bing and Gil Peck and was introduced in 1960 by Harold Fogle. Nearly black colored fruits which are about 1 inch in size. The plants are medium in hardiness and productivity. The fruits are susceptible to severe fruit cracking.

#### **4.10 Christiana**

It is a Bigarreau type sweet cherry, vigor is medium with wide branched habit. Fruit large in size (9–10 g), skin color dark red, fruit stone small, flesh has good acidulated sweet taste and it is medium firm. This variety is quite resistant to damage of flowers by late spring frosts and fruit cracking. The tree productivity is precocious and very high.

#### **4.11 CITH Cherry-01**

Developed through clonal selection from an old variety ‘Double Bigarreau Na Yield’ is higher in comparison to parent variety. It is suitable for cultivation under Kashmir valley and other Himalayan regions. Consumer acceptability is excellent due to its attractive bright glossy red color, taste and overall appearance. Trees are semi-spreading, suitable for high density planting. Five to six flower/spur and a prolific bearer with spur and bloom density is medium to high. Average yield is 9.35 t/ha at 8 years of age. Fruits medium to large in size, ovoid to heart shaped like ‘Double’ with long pedicles and firm fleshed. Fruit is red blushed on yellow background having high TSS (15.47° Brix) with good acid/sugar blend. It takes 52–55 days to mature after full bloom and is 10 days earlier to cv. Mishri [25].

#### **4.12 CITH Cherry-02**

It is a clonal selection from old variety 'Mishri' (Bigarreau Noir Grossa). It is regular in bearing, precocious and yields higher (3.85 kg/tree) than 'Mishri'. It is early to mid maturing variety having better quality and attractive red skin color. It is suitable to grow under high altitudes of temperate area of North Western Himalaya. Trees are upright, suitable for high density planting, leaves are glossy having drought escape ability. Spurs are bold and prominent having 5–6 flowers/spur. Spur and bloom density is medium and higher than 'Mishri'. Annual average yields of 10.24 t/ha after 7–8 years of age. Fruits are medium to large in size, dark red in color with prominent white dots on fruit surface. Fruits have high TSS (15.43°B) along with good acid/sugar blend. It takes about 51–56 days after full bloom to mature [26].

#### **4.13 Compact Lambert**

It is a radiation induced mutant of Lambert. Fruit are the same as Lambert. Trees are of reduced size, the dwarf tree is about 80 to 90 per cent of the size of the standard cherry tree, but there has been a problem with both the stability and the virus status of this cultivar. It bears heavily. Fruit size is good and color is black.

#### **4.14 Corum**

Corum is a light colored cherry with a pronounced red blush. It ripens 4 to 5 days before Royal Ann. It is a semi-firm, but productive and hardy cultivar. The flesh is not quite as firm as Ann's. Used as pollen source for cultivar Napoleon. The tree is considerably less susceptible to bacterial canker than Ann. It branches more freely and tend to spread more and to bear at an earlier age.

#### **4.15 Danube**

It is a new tart cherry for fresh consumption and ripens a few days earlier than 'Montmorency'. The fruit is dark red, medium to large, and sweeter than most tart cherries. This variety is being planted widely in Europe.

#### **4.16 Early Burlat**

Fruits are large and moderately firm. The fruits are harvested approximately two weeks before 'Bing'.

#### **4.17 Emperor Francis**

It is a high quality cherry of Napoleon type. It is less susceptible to cracking than Napoleon. It is the major cultivar being used for brining. The fruits are large, yellowish white with a red blush, firm, attractive, good quality, moderately hardy and productive. Used for both brining and fresh consumption.

#### **4.18 Gold**

It is easily bleached for brining as it has no red pigment. This is an early maturing variety. Trees are hardy and productive and fairly resistant to cracking and bacterial canker. Much cold tolerant as compared to most of other cultivars. Fruit

are small and is in a unique pollination group as it is able to serve as a pollinizer for many other brining varieties.

#### **4.19 Hardy Giant**

Fruits are large in size, dark red in color, good in flavor and resemble 'Bing'. It is a late bearer and a good pollinizer for other sweet cherries, especially 'Lambert'.

#### **4.20 Hedelfinger**

It is an old European variety. The trees are early bearing and very productive. The fruit is resistant to cracking than most other varieties. The black fruit is medium to large, firm fleshed, high quality late cherry of Lambert type. Fruits are very soft and if not picked at the proper stage of maturity, fruit quality becomes low. The fruit is good for fresh consumption, freezing and processing. It ripens just ahead of Windsor and Lambert.

#### **4.21 Hudson**

This is a hybrid resulted from a cross between 'Oswego' x 'Giant'. Fruits are dark red, medium to large in size, sweet, very firm, very good quality, low field susceptibility to fruit cracking and ripen very late. The plants are medium in hardiness and productivity. Fruit can be harvested over an extended period of time because of its firmness. Good for refrigerated storage of fruit.

#### **4.22 June Bright**

This variety was selected from open-pollinated seedlings of Nanyo. The plants are vigorous and cold tolerance. It is early ripening cultivar, mature in late-June. The fruits are medium to large (6–8 g), skin color is bright red blush on a yellow background. The flesh is white coloured, sub-acidic with TSS (14–15%) and acidity (0.52–0.64%).

#### **4.23 Kiona**

This cultivar originated from a cross between Glacier and Cashmere cultivars and released in 2007. It blooms mid-late season, generally 4–7 days after cv. Bing and the large red-purple fruit ripens 6–9 days before Bing. The plant produces very flavourfull fruits and taste. The TSS content of Kiona fruit is similar or greater than that of Bing. However the early sugar development and high acidity ensure a good balance of sweetness and acidity that contributes to the unique flavor of this cultivar that is highly sought after by consumers [27].

#### **4.24 Kordia**

This is a popular variety of European countries, originated in Germany. It is a self-sterile variety which matures late in the season. The fruits are large in size, dark black in color, firm with good flavor. The fruits are resistant to fruit cracking. 'Regina', 'Stella', 'Sweetheart' and 'Sunbrust' are best pollinizers for 'Kordia'.

#### **4.25 Kossara**

Originated from the parent combination of 'Rannacherna' x 'Bigarreau Burlat' by the method of embryo culture under *in-vitro* conditions. The tree is medium

in growth; it is very fertile and displays good compatibility with rootstocks viz. Gisela-5, *P. mahaleb* and *P. avium*. Fruit are medium to large in size (7.8 g), cordate in shape, dark red color of fruit skin, red flesh, juicy, having a pleasant sweet sour taste. The cultivars 'Rivan', 'Nalina' and 'Bigarreau Burlat' are good pollinators [28].

#### 4.26 Kristin

It resulted from a cross between 'Emperor Francis' and 'Gil Peck', and was introduced in 1982. This was named due to its outstanding performance, yield and quality in Norway. Trees are vigorous, precocious in bearing and moderately productive. Fruits are large (1.0 inch in size), aromatic, firm, sweet, dark red, attractive good in quality, combining good flavor and high soluble solids. Fruit can be used for fresh consumption and processing. Fruits are moderately resistance to rain cracking.

#### 4.27 Lambert

It is grown primarily as a late maturing black variety for freezing and shipping in Oregon. Fruits forms black flesh has a super flavor when fully mature, medium sized (7/8 inch size) but tends to be quite small with a heavy crop. The fruit is distinctly heart-shaped and pointed. Very susceptible to fruit cracking and plants are productive.

#### 4.28 Lapins

Originated as a result from a cross between 'Van' and 'Stella' and was introduced in 1983. The plants are very productive. A late maturing dark sweet cherry with commercial possibilities. The fruit is resistant to rain induced fruit splitting. Fruits are large in size, high yielding, good flavor and taste.

#### 4.29 Montmorency

It originated in the Montmorency Valley of France before the 17th century. The trees are productive and the fruit are relatively large, bright red, white fleshed, have clear juice, firm flesh, and are of good quality. This is the standard tart cherry variety and about 90% of the tart cherries grown are 'Montmorency'.

#### 4.30 Napoleon

It is also called 'Royal Ann' or 'Napolean Wax'. The fruit is medium to large, oval and yellow in color with a red blush, firm, sweet and juicy fruits which are of good quality. It flowers late and fruit matures by the end of June. It is fairly resistance to cracking and below average hardiness are the major drawbacks.

#### 4.31 Northstar

It is a cross between 'English Morello' and 'Serbian Pie'. The mahogany red fruit has red juice, and is medium size. Trees are small, which makes them easy to cover with bird netting. The trees possess some resistance to leaf spot and brown rot.

#### 4.32 Rainier

Originated from a cross of 'Bing' x 'Van'. The plants are vigorous, extremely hardy and very productive. It bears early and ripens four days before Napoleon.



Fruits are large, firm and are of high quality. The skin is attractive yellow with considerable high red blush. The flesh is light yellow and juice is colorless. It is fairly sweet. The fruit is good for brining or fresh consumption. It is effectively pollinated by Napoleon and Emperor Francis. Susceptible to moderate rain cracking results in large crop losses. Bruise susceptibility may require field packing to minimize loss.

#### **4.33 Regina**

This variety was originated in Germany and is self-sterile. The fruit matures late i.e. one month after Burlat. The fruits are large in size with good taste and very good resistance to cracking. This variety is compatible with Gisela 5 rootstock. The cultivars 'Kordia', 'Lapins', 'Merchant' and 'Stella' are good pollinizers for 'Regina'.

#### **4.34 Rosita**

Selection from an open-pollinated population of 'Bigarreau Burlat' cultivar. The tree is moderate in growth, highly productive and it has a good compatibility with the rootstocks viz. Gisela-5, *P. mahaleb* and *P. avium*. Fruit ripens very early, medium to large size (7.1 g). The fruit is kidney-shaped and the fruit skin is basically pale yellow in color with a light red tint covering upto 50 per cent of the surface. Fruit flesh is soft, gentle, pale yellow in color, very juicy, with a pleasant sour-sweet taste and transparent juice. The cultivars 'Rivan', 'Nalina' and 'Bigarreau Burlat' are good pollinators of 'Rosita' [29].

#### **4.35 Ruby**

It is a new promising early sweet cherry cultivar. It is precocious and productive. Fruit are medium in size (7.1–10.2 g) red in color, having a firm juicy flesh, high sugar (14.8%) and low acid (1.2%) content. The acid-sweet flavor is quite popular to consumers. It is resistant to fruit cracking and has a good shipping quality, suitable for both open-field and protected cultivation. Its chilling requirement is low. Under 0-5°C condition it could be stored for more than 40 days without losing flavor.

#### **4.36 Sam**

The fruits are tolerant to cracking, lacks in firmness of the fruits. Plants are hardy, but only moderately productive. Late in blooming. Fruits are black in color with medium (3/4–7/8 inch) in size. Often listed as bacterial canker resistant, but it is susceptible to certain strains of this disease.

#### **4.37 Schmidt**

Fruits are large, firm, attractive and of good quality. Trees are slow coming into bearing and unreliable in cropping. The effective pollination period is very short so that unless conditions are ideal for pollination and fertilization, light fruit set can be a problem. Susceptible to severe cold.

#### **4.38 Skeena**

This variety was derived from 2C-60-07 and 2C-38-32. A dark mahogany cherry that have very large fruits (11.1 g), symmetrical and kidney-shaped, red to dark red flesh color. Fruit flavor is strong and good with a pleasant sweet/acid balance. It

is superior to 'Lapins' and the fruits are produced in looser clusters than 'Lapins'. The fruits are resistant to rain induced cracking [30]. This variety is self-fertile and blooms in mid-season.

#### **4.39 Sonata**

Developed in British Columbia and introduced in 1996. It is a self-fertile variety, plants are vigorous with good productivity. The fruit is very large, firm with lustrous mahogany to black skin, a plump kidney shape and a well-balanced, sweet flavor. This variety does not resist cracking. The fruits are harvested before Lapins but after Bing variety.

#### **4.40 Starblush**

It is a large-fruited, self-fertile blush cherry that ripens later than Rainier and Lapins. The fruit is heart-shaped with medium to long stems and firm flesh. The trees are vigorous and somewhat upright in growth habit. It had low levels of rain-induced splitting. The crop levels are medium to high. Flavor is medium to good after storage and pitting is only slight [31].

#### **4.41 Starkrimson**

Only for the home market in areas where rain cracking is not a problem. It is productive, firm, and of good quality, but it is extremely susceptible to rain induced fruit cracking.

#### **4.42 Stella**

Originated from a cross between 'Lambert' and 'John Innes Seeding' and was introduced in 1968. It is the first self-fertile cherry which ripens early i.e. starting June. Fruits are dark red in color, large, one inch in size, heart shaped and flesh is semi-firm. Moderately susceptible to rain induced fruit cracking. Trees are very vigorous and productive but tender to winter cold.

#### **4.43 Summit**

Originally from Canada, matures sixteen days after Burlat. Outstanding for its large fruit size, firm, excellent flavor and quality. The fruits are susceptible to cold and rain cracking of the fruit.

#### **4.44 Sunburst**

A mid-season dark sweet cherry, reported to be outstanding for large fruit size, high yield, and self-fertility. The plants are productive. It is more resistant to rain splitting than many commercial cultivars. Lacks in fruit firmness, so not recommended for transportation to distant markets where long term storage is required.

#### **4.45 Sweetheart**

It is a self-fertile cherry resulting from a 'Van' x 'Newstar' cross in 1975. It is very late maturing sweet cherry cultivar. Trees are productive and fruit is medium to large in size (9.9 g), very firm and has good flavor. The fruit is dark red and moderately resistant to cracking.

#### **4.46 Symphony**

This is a self-fertile variety originated in Canada having high productivity. The fruit is bright red in color, medium to large in size with good taste with and matures late in the season. This variety is moderately resistant to rain-cracking.

#### **4.47 Tehranivee**

It is a new mahogany colored self-fertile sweet cherry with black red juice. It has excellent flavor as well as size, sweetness and firmness. It is a mid-season cherry developed in Ontario, Canada which ripens in the end of July. The fruits are susceptible to fruit cracking.

#### **4.48 Tieton**

It produces a very large cherry that has a beautiful cluster. The flavor is very mild. Susceptibility to rain cracking of fruits is very high. This variety ripens early but just after Chelan, bloom time is just before Bing. Bing, Van and Rainier can serve as pollinizers.

#### **4.49 Ulster**

It is a cross between 'Schmidt' and 'Lambert' and was introduced in 1964. Fruits are large, sweet, firm, crisp and nearly black in color, (dark red) 3/4 to 7/8 inch in size. Trees are medium hardy and productive. Resembles 'Schmidt' but more productive. The fruits are moderately resistant to rain cracking. Good for fresh consumption and processing.

#### **4.50 Utah Giant**

This variety ripens with 'Bing' and is susceptible to severe fruit cracking. Fruits are large and of good quality.

#### **4.51 Valera**

Ripens a few days before 'Bing'. Fruits are medium sized, semi-firm, good quality fruit. Trees are vigorous and early bearing. Fruits are less clustered, and not as susceptible to brown rot as 'Venus'.

#### **4.52 Vandalay**

It is originated from a cross between 'Van' x 'Stella'. Large, wine-red colored fruit have a kidney shape and purple juice. It is a self-fertile cherry which is resistant to cracking and canker.

#### **4.53 Van**

It is an open-pollinated seedling of Empress Eugenie, introduced at the Summerland in 1944. Trees are very vigorous and hardy. It comes into bearing early and is very productive. Fruits are large, black in color, with bright luster, very firm with short stem, 3/4–7/8 inch in size. It is very susceptible to bruising. Fruit develop in clusters so brown rot control becomes a problem. It is less susceptible to cracking and quality is good.

#### 4.54 Vega

Fruits are very large and attractive. It has a small, easily removable pit. It is larger, firmer, and earlier than most white cultivars, but it remains tart until it is very ripe.

#### 4.55 Venus

Fruits are dark red in color, 3/4–7/8 inch in size and semi-firm in texture. Medium in hardness and very productive. It has a tendency to overbear in some years, especially under conditions which favor good cross pollination.

#### 4.56 Viscount

The fruits are medium to large in size, kidney shaped, firm, good quality, dark red glossy in color. It ripens with 'Bing'. It is highly resistant to rain-induced fruit cracking. It is also resistant to diseases caused by *Monilinia fructicola* and *Pseudomonas syringae*.

#### 4.57 Vista

Fruits are nearly black in color, 7/8 inch in size, semi-firm in texture. The plants are medium in hardness and productivity. Cracking is often a serious problem, especially in young plantings with light crops.

#### 4.58 Viva

Fruits are dark red in color, 3/4 inch in size, semi-firm in texture. Good fruit crack resistance but this may be due to its soft texture.

#### 4.59 Vogue

A large, shiny, dark red sweet cherry with a small pit. Ripens with Bing and is productive. In heavy crop years it sets in bunches so that careful spraying is required for brown rot control.

### 5. Peaches and nectarines

Peaches and nectarines are fruit species which are typically self-fertile and naturally self-pollinating. Although polyploidy is common in the *Prunus* genus, five species may be referred to as 'Peach'. *P. persica*, *P. davidiana* (Carr.) Franch, *P. mira* Koehne, *P. kansuensis* Rehd., and *P. ferganensis* Kov. & Kost., all of which are diploid ( $2n = 2x = 16$ ) [32, 33].

According to geographical distribution, the peach cultivars have been divided into three groups namely, Northern, Southern and European or Persian group. Peach cultivars can also be divided into two groups high chilling and low chilling on the basis of their chilling requirements. Low chilling cultivars developed in Florida during last three to four decades have become very popular in the sub-mountainous Himalayan region. Description of different high and low chill varieties of both peach and nectarine grown in various parts of the world is here under.

## **5.1 High chilling peach varieties**

### *5.1.1 Alexander*

It is an excellent early season cultivar, ripening in the last week of May to first week of June and is a mediocre bearer. Fruit is medium to large in size, round with unequal sides, skin is smooth, beetroot purple, with some patches of pod green color, flesh is soft, greenish white juicy, very sweet, aromatic and free stone, keeping quality is not so good.

### *5.1.2 Allstar*

The fruit matures two days prior to Harrow Beauty and is a medium sized, bright red fruit with clear yellow flesh. The fruit is medium firm with fair quality. The fruit and the tree have shown signs of bacterial spot.

### *5.1.3 Babcock*

The plants are vigorous and productive. The fruit is small to medium round to ovoid spherical, having prominent ventral suture [13]. The skin is light pink with a deep red blush. Flesh is white, very sweet and is free stone. It ripens two weeks before Elberta.

### *5.1.4 Babygold*

It is an introduction by Rutgers in 1961 which ripens early and is suitable for processing purpose. Its parentage involves several cultivars including J H Hale and Gold Finch. It is a canning non-melting clingstone with yellow flesh and red at the pit. It is much less rubbery when canned than the other non-melting clingstones, the fruit is of large size, tree is productive and winter hardy, although prone to crotch injury. The fruit is susceptible to brown rot disease and tends to drop at maturity.

### *5.1.5 Blazingstar*

The fruit matures three days after Redhaven. Fruit are highly coloured, round and attractive, firm, yellow fleshed peach. Size and fruit quality are acceptable. The fruit and the tree are susceptible to bacterial spot.

### *5.1.6 Blushingstar*

Fruits are harvested 2–4 days after Loring and are round, medium to large fruit attractively blushed with pinkish red over color, firm flesh white and good quality. Plants are productive but moderately susceptible to bacterial spot disease.

### *5.1.7 Bounty*

The fruit ripens two days before Loring. It has more color compared to Loring, and is round in shape with better flavor. Bounty has had light crops under extreme cold winter conditions in Ontario.

### *5.1.8 Candor*

It is a hybrid originated from a cross (Red Haven x Early Red Free) in Carolina, USA [13]. Tree is small, a prolific bearer, regular, self-fruitful and has



a medium chilling requirement. Fruit is medium in size, round in shape with pointed blossom and with excellent flavor. The skin is bright red on rich yellow ground and is deep red near the blossom end. Flesh is yellow and texture is fine, firm and freestone. Fruit ripens before the onset of rains and is a promising cultivar for hills.

#### *5.1.9 Coralstar*

The fruit matures four days prior to Harrow Beauty and is medium to large in size, bright red and has clear yellow flesh. The fruit is medium firm with only fair to poor quality. The fruit and the plants are susceptible to bacterial spot.

#### *5.1.10 Cresthaven*

The fruit ripens ten days after Harrow Beauty with firm, large fruit. It is moderately susceptible to bacterial spot. The fruit lacks sufficient color to compete against other cultivars.

#### *5.1.11 Dixigem*

It resulted from a cross between Admiral Dewey and St John in 1944. Tree is vigorous, productive and needs about 950 hours chilling. The fruit is of medium size, round, with a bright yellow skin having light blush [13]. Flesh is light yellow with good texture and is free of stones. It matures about a month before Elberta.

#### *5.1.12 Early Amber*

It is a low chilling cultivar (350 hours), bred in Florida. Tree is vigorous, fruit is medium in size. Skin is yellow with dark-red blush [34]. Flesh is yellow of good quality and is clingstone.

#### *5.1.13 Early Redhaven*

This bud sport of Redhaven, ripens few days after Garnet Beauty and 10–12 days before Red haven, but with similar characteristics. The fruit may be more highly colored and smaller, and the firmer flesh tends to be clingy. Early Redhaven has been widely planted during recent years.

#### *5.1.14 Early White Giant*

The fruits are medium to large, free stone, flesh sweet and most appealing in flavor, good bearing quality, ripens in the second week of June.

#### *5.1.15 Elberta*

It is an open-pollinated seedling of 'Chinese Cling', introduced in 1889. The tree has non-showy blossoms. This cultivar is best known as yellow canning peach. Fruits are large, oblong, very pubescent, fairly attractive, skin smooth, pale yellow with red a splash. The fruits are firm and juicy, sweet in taste, flesh yellow and clingstone. The fruits are best suited for canning. It is a mid to late season variety and the fruits are harvested in the last week of August. The tree is moderately resistant to bacterial spot.

#### *5.1.16 Florda Red*

It is an excellent mid-season table peach maturing in the beginning of June. Tree is vigorous in growth. Fruit are large, almost red at maturity, juicy with soft white flesh and free stone.

#### *5.1.17 Flordaqueen*

It was evolved by R H Sharpe in Florida and needs 550 chilling hours. Tree is productive and the fruits are round yellow with a light red blush. Flesh is firm and yellow. It is clingstone with a fair quality.

#### *5.1.18 Flordasun*

It is a low chilling cultivar developed in Florida. Plants are spreading and vigorous. It is an early maturing cultivar which ripens towards last week of April to first week of May. Fruit is medium sized, freestone, round in shape with red blush on the surface, pulp yellow, acidic-sweet taste with 11.5 per cent total soluble solids.

#### *5.1.19 Garnet Beauty*

This bud sport of Redhaven ranks second in number of trees to its parent in Ontario. Garnet Beauty is a good-quality peach, ripening about a week after Harrow Diamond. It is attractive, usually not subject to split-pits, but not fully freestone [35].

#### *5.1.20 Glohaven*

It is a cross between an open pollinated seedling of J H Hale and Kalhale. It was introduced by South Heaven in 1964. This is a yellow free stone variety of good size and quality. Its outstanding characteristics are its dark red, tough skin with very slight pubescence. The flesh is firm. Resistant to flesh browning, and has almost no red around the pit. It is satisfactory both for fresh fruit and canning. Large nearly round, attractive yellow freestone fruit. Very tough, mostly red skin is practically fuzzless with a deep yellow ground color. Firm yellow flesh is resistant to browning, superior for canning and freezing qualities. Plants are vigorous and productive, excellent quality for fresh market and commercial processing. Keeps and ships very well.

#### *5.1.21 Glowingstar*

The fruit ripens 11 days after Harrow Beauty and has medium to large sized fruit with good crops. The fruit has a bright red color with good blush and quality. It has good tolerance to bacterial spot.

#### *5.1.22 Harbrite*

The fruit ripens four days after Redhaven. It is bud hardy and a good peach for its season. The fruit is medium to large, round, with an attractive red color and resistant to bacterial spot and brown rot.

#### 5.1.23 Harcrest

The fruit ripens just before Redskin and promises to be a late season cultivar with good disease resistance. The fruit of Harcrest are medium large, quite firm, good quality and have good winter hardiness and disease resistance but no better blush than other cultivars in this late season.

#### 5.1.24 Harrow Beauty

The fruit ripens with Loring and Canadian Harmony but is more winter hardy. The very firm, highly attractive, medium sized fruit ships well. The rich yellow flesh has a red pigment around the pit cavity. Leaves and fruit have good resistance to bacterial spot and brown rot.

#### 5.1.25 Harrow Dawn

This variety ripens eleven days before Redhaven. Plants are hardier than Redhaven, vigorous, productive and medium-to-high field resistance to bacterial spot, brown rot and canker. Fruit is very attractive, bright red blush on a yellow background, uniform ripening, medium size, firm yellow flesh, usually freestone when ripe, medium-to-good quality, very few split-pits.

#### 5.1.26 Harrow Diamond

The fruit ripens about a week before Garnet Beauty. It is winter hardy, disease resistant and has few split-pits. The fruit have an attractive red blush over a bright yellow background; the deep yellow, low oxidizing flesh is of good quality and is nearly freestone when fully matured [35]. Because the fruit is small to medium sized, this cultivar must be thinned early and adequately to obtain suitable size.

#### 5.1.27 J H Hale

Around 1900, a peach grower J.H. Hale found an off type plant in his farm which performed well at Georgia due to its superior firmness. After that this variety is widely planted in USA and was often used in breeding programmes. It is thought to be a chance seedling of Elberta. The cultivar is self-unfruitful. Plants grow vigorously with an average plant height of 15–20 feet. The plants have a low flowering intensity (up to 1.50 flowers per inch). Fruits are fuzzy, yellow skinned with slight red blush. Fruit flesh flavored, texture fine, yellow and freestone. The fruit weight is 81.1 g with a TSS (11.1°B), acidity (0.81%) and TSS/acid ratio (14.7).

#### 5.1.28 July Elberta

The plants vigorously growing with a rounded tree top. The peach is the most adaptable of all fruit trees for home gardens. At 3 or 4 years of age they begin to bear large crops and reach peak productivity at 8–12 years. Peaches need clear, hot weather during their growing season and require well-drained soil as well as a regular fertilizing program. They also require heavier pruning than any other fruit trees to maintain size and encourage new growth. The fruits are large, sweet, freestone with a golden yellow flesh. The fruits skin is highly pubescent. The average fruit weight was (73.9 g) with TSS (12.0°B) and acidity (1.03%). The fruit matures a fortnight before Elberta.

#### *5.1.29 Kanto 5*

This is a late maturing cultivar, the trees have vigorous and upright growth habit. Fruit skin color is yellow with red blushes. The flesh is yellow, juicy and clingstone. The average yield of five year old plants yields 120.5 kg of fruit. Fruits weigh of 127.8 g with TSS (13.5°B) and acidity (0.73%).

#### *5.1.30 Loring*

This late season peach is large, firm, yellow-fleshed, freestone and known for its good quality. Loring lacks winter hardiness and should not be planted on marginal sites. Once an industry standard, it now lacks sufficient red skin color to compete with newer cultivars.

#### *5.1.31 Khurmani*

The tree is medium and upright in growth. It blooms in early February and fruit ripens slightly earlier than Suffeda. The fruit is large, weighing about 70 g and is attractive with red colouration. It is slightly pointed at the base. It is a clingstone cultivar with white, soft and juicy flesh.

#### *5.1.32 Maygold*

It is a cross of Sunhigh and Southland, selected in Georgia, USA. Tree is vigorous, productive, precocious and self-fruitful. Its chilling requirement is 650 hours. Fruit is medium to large, ovate, skin is yellow with more than half red. Flesh is yellow, firm, melting is of good flavor and is clingstone [34]. It ripens in second week of June and is an early promising cultivar.

#### *5.1.33 Pratap*

It matures a week earlier than the Flordasun cultivars take 76 days for maturity. The color of its fruit is yellow with red blush and flesh color is also yellow with red coloration. It yields 70 kg fruit per plant and its average fruit weight is slightly higher than the Flordasun. Due to its significantly better firmness and slightly acidic characteristic it has better keeping quality than Flordasun. Also its tree remains smaller in size as compared with Flordasun.

#### *5.1.34 Redhaven*

It is a cross of Halehaven and Kalhaven introduced by Stanley Johnston at Michigan in 1940. It is a widely planted cultivar. It has firm, excellent flesh which enables easy picking and handlings. Fruit is of red color and good size [35]. It is a regular cropper and the tree set heavy crops and must be adequately thinned to attain size. It is a mid-season variety and ripens about 30 days before Elberta. It has a chilling requirement of 950 hours.

#### *5.1.35 Redstar*

The fruit ripens with Redhaven and is medium sized with good crops. The fruit has a scarlet orange color with good blush, fair quality and few split-pits and tolerance to bacterial spot.

#### 5.1.36 *Redskin*

The fruits are of medium sized, good quality, late ripening freestone with fairly good color. Trees tend to be somewhat willowy but are very productive.

#### 5.1.37 *Red Globe*

It is originated in Maryland from (Admiral Dewey x St. John) x Fireglow cross. Plants are vigorous, productive and its chilling requirement is similar to that of Elberta. Fruit is medium in size, round with a bright red blush and is suitable for freezing, canning and for long shipments. Flesh is yellow fine textured, firm, melting with a small stone.

#### 5.1.38 *Rio Oso Gem*

It had originated in California. Its fruit is large, round to elongate, with an attractive skin. Flesh is yellow, fine textured, firm with good quality and freestone. Its chilling requirement is 850 hours. It resembles J H Hale and ripens a week before Elberta.

#### 5.1.39 *Risingstar*

The fruit ripens one day before Garnet Beauty and medium in size with fair to good crops. It has an orange red color with good blush, fair to good quality and few split pits and tolerant to bacterial spot.

#### 5.1.40 *Shimizu Hakuto*

The fruit matures in the second week of July. Plants are dwarf and spreading. Fruits are medium in size, quite firm roundish, red blushed on creamish background. TSS recorded was 18.0 per cent with excellent flavor, flesh white, cling stone.

#### 5.1.41 *Springcrest*

Fruit ripens two days prior to Harrow Diamond and is considered an early peach for the local fruit stands and fruit markets [35]. Fruit size is small and has several early split-pit fruit. Skin can be very deep purple as it matures. This cultivar is also winter sensitive.

#### 5.1.42 *Starfire*

It ripens few days after Redhaven and has medium fruit with good crops. It has scarlet orange red blush with good fruit quality and few split pits. It has good tolerance to bacterial spot.

#### 5.1.43 *Suncrest*

This variety was originated as a result of a cross between Alamar and Gold Dust. It is late maturing in the first week of July. Fruits are large, round, freestone, firm and hold well during shipping. The fruit is uniform and highly color with excellent quality for both fresh and canned products. Fruits have attractive color to about 80



per cent bright red blush over yellow background. Flesh is yellow and exceptionally firm with good texture and flavor. Vigorous, self-fruitful, productive trees have a good hardiness record where tested in Eastern sites. Good shipper that is proving to be a good commercial market peach.

#### *5.1.44 Sun Haven*

Originated as a result of crosses involving Red Haven, J.H. Hale and Halehaven. It is a fair sized yellow melting flesh, clingstone, with firm texture and good flavor, and is very resistant to flesh browning. It matures during mid-June almost ten days before Red Haven. It has fairly good skin color. Fruits are bright red with yellow gold cheeks.

#### *5.1.45 Veteran*

It is a cross between Vaughan and Stark's Early Elberta originated in Canada. Tree is very productive. Fruit is medium to large, round, oblate and is harvested ten days before Elberta. Skin lacks red color and flesh is soft. It is suitable for both fresh and canning purpose. The chilling requirement is also high being 1150 hours [20].

### **5.2 High chilling nectarine varieties**

#### *5.2.1 Fantasia*

Originated as a hybrid from a cross of Gold King x an open-pollinated seedling of Red King. The fruit ripens late in the season with Cresthaven peach. The fruits are medium to large, attractive, bright red with a yellow ground color, freestone and firm fleshed. The plants are moderately hardy and moderately resistant to bacterial spot [35]. Fantasia is the main commercial nectarine in the Niagara Peninsula.

#### *5.2.2 Flavortop*

The fruit ripens just after Loring and are large, ovate and freestone with excellent quality. Skin is highly blushed over an attractive undercolour. Flesh is yellow, firm and smooth textured. Trees are vigorous but produce light crops and are tender to winter cold. Fruits are also susceptible to bacterial spot [35].

#### *5.2.3 Harblaze*

This cultivar has promise as a commercial type nectarine that ripens during the late Redhaven season. The vigorous, productive trees bear attractive medium to large sized fruits that are semi freestone. The fruit tends to soften quickly near maturity during final swell. Harblaze is relatively winter hardy and has a good level of resistance to bacterial spot, brown rot and powdery mildew.

#### *5.2.4 Harflame*

The fruit ripens few days before Harblaze. The plants are hardy as Redhaven, medium vigor, somewhat upright and moderately productive. It has good field resistance to bacterial spot, brown rot and canker. The fruit is attractive, medium in size with 80 per cent blush on yellow background. It is semi freestone, ripens uniformly with a medium firm yellow flesh, medium quality and a low incidence of split pits.

### *5.2.5 Independence*

It is freestone variety, early ripening. Fruits are golden having a red cherry blush. Fruit firm, sweet with acidic blend, good textured and flavor. Ripening in the first week of July. Fruit covered with red color, ground color yellow. Flesh of the fruit is yellow and firm.

### *5.2.6 May Fire*

Plants are vigorous and require more than 150 chilling hours. Fruits are medium, smooth, skin color green to white with deep red over color. Flesh white, attractive, juicy, clingstone and sweet with good quality. Fruit matures very early to mid-May.

### *5.2.7 Red Gold*

This nectarine variety was developed by crossing 'Halberta Giant' x 'Sunrise'. A late maturing variety with harvesting season is mid-August. The plants are productive and have non-showy blossoms. The plants are vigorous, heavy and regular bearer. Average diameter of this nectarine is about 3.0 inches. The fruit is freestone having 50–70 per cent of the surface covered rich red over yellow background. The flesh is yellow with red around the pit and has the ability to hold firmness making it an excellent storage and shipping nectarine. The flavor is very good to excellent, taste is sweet. This nectarine is the standard in its season. Fruits are also susceptible to bacterial spot and mildew.

### *5.2.8 Silver King*

This is an early maturing variety ripening in the third week of May. Fruits are medium in size with ground color is greenish white, 3/4 fruit covered with dark red blush. Fruits are very attractive, taste sweet and flesh is greenish white. The plants are vigorous and are heavy yielders. Fruit set is very high, require heavy thinning and heavy pruning.

### *5.2.9 Snow Queen*

The plants are heavy bearer having fruits of medium size, skin color white with shinning red over color, smooth without fuzz, Flesh white, good flavor and clingstone.

### *5.2.10 Spring Bright*

This variety was developed as a hybridized seedling from May Diamond and an unnamed seedling. This is a mid-season variety, ripening in third week of June. Fruits are large in size with greenish yellow ground color. Fruit is very attractive, almost whole fruit is covered with maroon red. Skin little rough, flesh is firm, crunchy, crispy and yellow. Red tinge or stripes may appear in the flesh if harvested late. This is a freestone variety having sweet taste with acidic blend. Trees are compact type, semi-dwarf, regular, heavy bearer and require little thinning.

### *5.2.11 Summer Bright*

The is fruit large, clingstone in type, very firm, deep red over a reddish orange background in skin color, and both acidic and very sweet in flavor. The variety is a cross between Red Diamond and an unnamed nectarine.

### **5.3 Low chilling peach and nectarine varieties**

#### *5.3.1 Early Grande*

It is a selection from the cross Fla558 [(Southland x Jewel) open pollinated] x Early Amber which performed very well in Punjab. Plants are semi-vigorous, high yielding and fruit maturity occurs in the first week of May (4 days earlier than Shan-i-Punjab). Fruits are large (90.0 g) with red blush on the surface with TSS (10.5%) and acidity (0.7%). Pulp yellow, firm (firmness of 10.9 lbs./inch<sup>2</sup>) and some red colouration next to the pit and semifree from stone when fully ripe. Fruits possess excellent shipping quality.

#### *5.3.2 Florda Prince*

Plants are vigorous and the fruits mature in the fourth week of April. Fruit size medium (65–70 g); yellow with red blush at maturity, flesh firm and free stone at full ripe stage. Average yield 100 kg per tree with a (TSS 12.0%) and acidity (0.5%).

#### *5.3.3 Pant Peach 1*

This variety was released by GBPUA&T, Pantnagar in 1998. This is a chance seedling selection from the population of cv. Sharbati under Pantnagar conditions. It ripens about one week prior to Sharbati but fruit quality is similar to Sharbati.

#### *5.3.4 Saharanpur Prabhat or Prabhat*

It is a variety developed at HTTC, Saharanpur by crossing Sharbati and Flordasun. The trees are upright having strong and thin primary limbs. Fruits are medium in size with attractive red blush, round, truncate in shape with pointed apex with good taste having good keeping quality. Flesh is sweet, freestone, white having excellent flavor. This variety ripens in the third week of April, about 4 to 6 days earlier than the Floridasun which is one of its parents. The fruits are very similar to Floridasun in shape. It gives good fruit yield on peach and plum seedling rootstock.

#### *5.3.5 Shan-i-Punjab*

This is early cultivar, maturing in first week of May. Plants are vigorous in growth. It produces large fruits of 5–5.5 cm diameter weighing about 90 g each. The color of the fruit is yellow with red blush, juicy and sweet with excellent taste, flesh yellow and completely freestone. The fruit is quite firm in texture and can withstand transportation. In addition to its table use, this cultivar has also been found suitable for canning. The average yield is about 70 kg per tree.

#### *5.3.6 Sharbati*

It is chance seedling selected at Saharanpur. It has medium sized fruit, which is clingstone and is round-oblong shape, flesh is white, soft, juicy and aromatic. It is a heavy yielder and ripens late in second week of June. It is very popular in plains of Western Uttar Pradesh. Total soluble solids and acidity observed was 13.0 per cent and 0.33 per cent, respectively. Chilling requirement ranges between 30 and 40 hours.

### 5.3.7 Tropic Beauty

This variety was released in 1988. Fruit have a high percentage red over color on bright yellow background with very short fuzz, making the fruit highly attractive. The round, firm fruit have melting, deep yellow flesh that frees from the pit at soft ripe. Fruit is medium in size, red skinned semi freestone with soft, yellow flesh, excellent flavor. The fruit ripens in mid-May. It is low chill variety which requires around 150 chill hours.

### 5.3.8 Tropic Snow

Fruit have a moderate to light yellow with red blush, flesh sweet and white. Fruit taste tart, but sweet very early and firm at harvest. It is a medium sized, delicious white freestone peach that has creamy white, firm, aromatic flesh with balanced acid and sugar and superb flavor. It requires 175–200 hours chilling requirement.

### 5.3.9 Tropic Sweet

Fruit skin color yellow, flesh color yellow, good quality freestone. Fruit are very large when thinned properly. The fruit ripens just after Tropic Beauty and the chilling requirement is 100–200 hours.

### 5.3.10 Sunred

It is low chilling nectarine bred by R H Sharpe in Florida. Tree is large heavy bearer and requires 300 chilling hours. Fruit is small, round with bright red skin and has excellent dessert quality. Flesh is yellow, firm and semi free stone. It ripens in first or second week of May.

### 5.3.11 Punjab Nectarine

The plants are vigorous and spreading. Fruit matures in 2nd week of May. Fruit large, weighing 90 g, round, attractive with 90–100 per cent red blush over yellow ground color at maturity, flesh yellow, firm, melting and freestone at full ripe stage. The fruits are sweet with acidic blend having TSS (11.5%) and acidity (0.8%). Average yield is about 40 kg/plant. It is a low chill nectarine which is suitable for plains of Punjab and lower areas of Himachal Pradesh.

### 5.3.12 Sunrise

It is a low chilling nectarine. Fruits are globose and medium thick skin having mahogany red color [20]. Flesh is yellow, firm, crisp and mildly sub acidic. It is semi freestone and ships well. The cultivar is medium in vigor, upright and bears a good annual crop.

## 6. Plums

Most plum cultivars belong to only two species: the hexaploid European plum (*P. domestica*) ( $2n = 6x = 48$ ) and the diploid Japanese plum (*P. salicina*) ( $2n = 2x = 16$ ). *P. domestica*, which categorized in European plums, is grown not only in Europe but also in other continents as the most common plum. Based on the fruit characteristics, this species can be divided into several groups including plums, prunes,

gage plums, and mirabelles, as well as the wild plums like cherry plums, bullaces, damsons, and sloes [36].

*P. salicina*, Japanese plums tend to be oval or heart-shaped and come in yellow, black, or red varieties. These types of plums have firm flesh and are often eaten fresh. Types of European plums are usually very sweet with juicier flesh and are used in baking or for making jams and jellies. There are many varieties of plums ranging in taste from sweet to tart. Some types of plums have a red sour flavored-skin that surrounds sweet juicy yellow flesh. Other varieties of plums are extremely sweet with dark purple skin and amber-colored flesh. Some of the varietal descriptions of plums include:

## **6.1 High chilling plum varieties**

### *6.1.1 Au-Rosa*

A dark red plum, medium to large in size with red flesh. Trees are very vigorous, spreading in nature and moderately productive.

### *6.1.2 Beauty*

It is a Japanese plum which is vigorous, heavy and regular bearing variety. It does not require pollinizers, but cross pollination may increase fruit set and also good pollinizers for other plums. The fruit is heart shaped, clingstone, greenish yellow to bright crimson and the flesh color is amber streaked with scarlet. The fruit ripens in June–July months.

### *6.1.3 Black Amber*

A mid-season plum with black red skin and an amber flesh. The fruit is large and very firm. This variety is susceptible to bacterial diseases caused by extreme humid climates and is not recommended under these conditions.

### *6.1.4 Black Beauty*

It is a Japanese plum that has bright yellow flesh and dark, deep purple-red skin. This drupe fruit is extremely juicy when biting into its firm flesh. This variety is dark red in color with oval shape, medium to large in and preferred for eating fresh. It has an excellent balance of sweetness with only hints of tartness.

### *6.1.5 Black Ruby*

It is one of the most popular types of black Japanese plums. It was originated from a cross of Queen Ann x Santa Rosa which was released in mid-90s by the USDA. The fruit is firm, juicy with reddish-black skin that surrounds yellow flesh. This round plum is one of the few sweet plum varieties that which ripens in late August. This variety is recommended for fresh eating. This variety is tolerant to humid climates, making it a great choice for southern districts.

### *6.1.6 Bluebyrd*

Released by USDA in 1998, Bluebyrd is an excellent European type plums for the commercial orchard and home garden use. The fruit is blue with amber flesh,



medium to large in size with excellent flavor and high sugar content. The tree is vigorous and productive, showing great resistance to black knot. This variety blooms before Stanley and requires cross pollination.

#### 6.1.7 *Bradley's King (Prunus insititia)*

An extremely hardy variety which blooms late and is a heavy bearer. It makes a vigorous tree and unlike other damsons, the wood is not brittle. Fruit is large for a damson. Purple skin with a blue bloom. Greenish yellow, dry flesh. Quite sweet with little of the bitter flavor characterizing damsons.

#### 6.1.8 *Bradshaw*

A Lombard plum, the fruit is medium large, oblong, purplish red, attractive and medium soft. The quality of the fruit is fair to good. The stone is semi-cling to clingstone. It is a late bloomer cultivar and are better adapted to areas with late frosts or cool, rainy spring weather.

#### 6.1.9 *Bruce*

One of the toughest plum trees, a Chickasaw Japanese plum hybrid. Flavor is tops; A frost hardy tree, ideal for low areas. Semi dwarf, weeping habit. Sunset orange fruit with a sweet mellow flavor. Needs a pollinator, ripens late May–June. It requires 500 chill hours.

#### 6.1.10 *Burbank*

The Burbank is a well-known old variety. The fruit is medium-sized and has attractive orange-red color that covers most of the surface with a base color that is amber-yellow. The flesh is yellow, fine-grained, firm and juicy, sweet and very good tasting. The peak harvest is in the second part of August–beginning of September.

#### 6.1.11 *Czar*

The fruits are on the large size with dark purple plums. The flesh is yellow. Traditionally use for cooking. Czar is also a good eater if the fruit are allowed to fully ripen. It has distinct advantage over some other plum trees of being self-fertile. It resists frost damage well. Fruit is produced in August.

#### 6.1.12 *Damson Plum*

It is hardy cultivar and bears small, roundish, dark purple-black, with firm green or golden yellow flesh, semi clingstone fruits. The flavor is poor in fresh fruit, but excellent in jam. It is self-fruitful. It is recommended for cultivation in Canada.

#### 6.1.13 *Early Golden*

A high quality early maturing plum with attractive red blush over golden yellow ground color, maturing 10–14 days before Shiro. Fruit is very sweet, small to medium in size. Tree are hardy, vigorous and productive. It needs cross pollination with another Japanese plum to ensure heavy cropping.

#### *6.1.14 Early Laxton*

It is a very early plum tree, producing ripe fruit from late July onwards. The plums have attractive yellow and light red skin. The flesh has a gage type flavor, yellow, full bodied and very juicy. It can be used for both eating and cooking. It was introduced in 1902 from Bedford, England. This variety ripens and ready for eating mid-August. It does require another plum tree for pollination and falls in pollination group. It is partially self-fertile, but will crop better with other plum trees nearby.

#### *6.1.15 Early Transparent Gage*

It is a regular and heavy cropper, prolific bearer with delicious fruits which are rather small and roundish. The color of the fruit is pale yellow with red dots and the fruit ripen in third week of July. It is a self-fertile variety.

#### *6.1.16 Fortune*

A Japanese type plum, trees are upright and vigorous in nature. The fruits are medium to large, reddish-purple and very firm, juicy. This attractive, good-tasting plum ripens in mid to second part of September. Cross pollination with other Japanese varieties is recommended.

#### *6.1.17 Giant Prune*

It is as Giant Plum which is a heavy cropping plum. Produces very large, dark red oval-shaped fruits that have medium blue bloom and some golden brown dots and patches on the fruits. The flesh is yellow, juicy, slightly sweet and peels away nicely from the the stone, freestone. It blooms late and is winter hardy.

#### *6.1.18 Golden drop*

It makes a spreading tree and is a shy bearer, blooms early and requires frost protection. It bears large fruits of quite exceptional flavor, pale yellow speckled with crimson. The fruit has rich apricot favor and characteristic sweetness.

#### *6.1.19 Golden transparent*

It is a Reine Claude like plum, which is vigorous, spreading with ovate to elliptic, toothed, mid to dark green leaves and white flower. It is self-fertile and blooms in the mid-season. The fruit is very delicious, small, oval to oblong, often red blushed, dull yellow to yellow green fruit and is late in maturity.

#### *6.1.20 Green gage*

It is a European cultivar and an old cultivar of the Reine Claude Group. It is one of the few green varieties of plums when they are ripe. The fruit is medium in size, roundish with greenish yellow skin. The flesh is firm, freestone and the flavor is sweet and very good. It tends to overset and bears biennially. The trees blossom in spring and the bumper crops are ready by the late summer.

#### *6.1.21 Italian*

A prune, it is also known as French Fellmbery Agen petite. Probably originated at Milan, Italy about 1800. The fruit is medium in size, oval and dark blue with a

heavy bloom. The flesh is firm, high in sugar content and good in flavor. Several early mutants such as, De Moris, Greata and Richards have been selected and grown commercially.

#### *6.1.22 Kelsey*

A Japanese plum, it produces a tree of moderate vigor. The fruit is heart shaped with greenish yellow skin and flesh. The flesh is juicy, firm and of good quality.

#### *6.1.23 Mariposa*

A Japanese plum, which is vigorous, upright growth habit, heavy fruiting in nature that requires cross pollination for adequate fruit set. The fruit is large heart shaped with greenish yellow fruit skin mottled with red. The flesh is red in color of excellent quality. It is self-fertile plum produces more fruit if a suitable cross pollinator is nearby planted. Excellent for eating fresh, preserves, jams and juices.

#### *6.1.24 Methley*

One of the first out of the orchard in mid-July, this is well known variety that has been present on the market stands for a long time. This variety is with fine quality and appearance. This fruit is harvested with a green shadow, but ripens to a vibrant purple with a deep red flesh, very juicy with a distinctive flavor. Methley is self-fruitful and a good pollinizer for Shiro.

#### *6.1.25 President*

It is a large blue/purple plum raised at the start of the 20th century by the Rivers Nursery, in Hertfordshire, England. The trees are adaptable to nearly any well-drained, loamy soil. It is an excellent dessert plum, being large, round in shape, rich purple with its deep yellow flesh, juicy and sweet. It blooms early and requires a polliniser.

#### *6.1.26 Reine Claude*

It is French variety of plum, the tree is compact, self-fertile and blooms very late. The richly flavoured fruit is large and have skin from pink to purple in color, speckled with white, flesh is crisp. Its flavor and coloring are both unique with high quality. Susceptible to some pests and diseases.

#### *6.1.27 Santa Rosa*

A Japanese plum, it produces an upright tree. The fruit is large purplish crimson in color. The flesh is amber with red near the skin. In India, this cultivar has established itself primarily because of its self-fruitfulness, prolific bearing and characteristic flavor, not withstanding the offending sour taste of relatively thick skin. A number of early and late maturing strains of this cultivar have been developed like the July Santa Rosa and Late Santa Rosa.

#### *6.1.28 Satsuma*

Satsuma plums are a Japanese variety of medium to small in size, red round plums are very sweet. It is also known as Blood Plum due to its deep red color of the

skin. The dark red (maroon) skins on this plum variety tend to be firm and tough with a sour flavor. However, the deep red-colored flesh is very sweet that offsets the bitter-tasting skin. It is a semi-clingstone variety, meaning that the flesh partially clings to the stone. The tree is upright and very productive. The fruit is susceptible to cracking in prolonged wet periods.

#### *6.1.29 Shiro*

The trees of this variety are spreading and very productive. A sweet, juicy yellow plum. Fruits are round, cling-stone, medium in size. It is a good pollinizer for Methley, Santa Rosa and Satsuma.

#### *6.1.30 Stanley*

A fine prune type plum with excellent quality suited for both home use or processing. Fruit is medium to large in size with a dark blue skin. Flesh is greenish yellow, juicy and fine grained. The tree is early bearing and a good pollinizer for other European varieties.

#### *6.1.31 Starking delicious*

A Japanese plum which ripens in the second week of August. The tree is upright, hardy and productive. The fruit is medium large with dark red skin and blood red flesh. The quality is good. This is a very good commercial Japanese type plum.

#### *6.1.32 Valor*

It ripens just a few days after Stanley. It was developed at Vineland, Ontario. The fruit has purple blue skin and yellow flesh, sizes medium large. It is a semi freestone and has great fresh market potential. The trees are healthy and productive.

#### *6.1.33 Vanier*

A hybrid originated from a cross of Wickson x Burbank, that matures one week after Wickson. Fruit is red medium size, yellow fleshed and clingstone. The trees are upright, vigorous and productive.

#### *6.1.34 Victoria*

One of the best known and popular of plum trees; produces pale red fruit. The fruit is ripe for eating around mid-August. It is a versatile plum tree, produces fruit which can be eaten, used for cooking and for jams. It produces a heavy crop which often needs to be thinned if fruits are to be produced each year. The victoria plums are produced in late autumn and it is self-sterile. This plum has stood the test of time, originally bred in Sussex around 1840.

#### *6.1.35 Wickson*

A large, greenish yellow heart shaped plum with yellow flesh. The tree is upright and vigorous and tends to be a shy cropper. Any of the Japanese plums will pollinate Wickson, however Wickson is not considered a good pollinizer.

## 6.2 Low chilling cultivars

### 6.2.1 *Satluj Purple*

The fruits are large, bright crimson having thick flesh and with good quality. The average yield is 40 kg per tree. It is self-incompatible and should be planted with pollinizer variety Kala Amritsari. Pollinizer should be planted as an alternate plant in alternate rows for maximum yield. Satluj Purple and Kala Amritsari plants should be planted in the ratio 85:25 in an acre. Trees are medium in vigor with upright growth habit. The fruit is medium large with average weight of 25–30 g, roundish, turns into crimson color on ripening. Fruits are thick skinned with yellow orange firm flesh. It is sweet in taste having 13–14 per cent TSS and 0.6–0.7 per cent acidity and is suitable for table purpose. It is an early variety ripening in the first week of May with average yield of 40 kg per tree.

### 6.2.2 *Kala Amritsari*

This is the most popular cultivar, particularly in Punjab. It is self-fruitful but yield improves if pollinated with Titron; high yielding indigenous variety with vigorous tree. Fruits are medium sized, round oblate depressed at both ends, on ripening turn dark purple. Flesh is yellow with moderately juicy pulp. Flesh is yellow, moderately juicy and excellent for jammaking. Fruits are somewhat acidic with 15.0 per cent TSS and 1.2 per cent acidity. It ripens in mid-May. Average yield is 45 kg/tree. Fruits are excellent for jam making.

### 6.2.3 *Pant Plum 1*

This is a selection from the seedling population raised at the Department of Horticulture, GBPUA&T, Pantnagar (Uttaranchal). It is dwarf and bears yellow and sub-acidic fruits. It can be a dwarfing rootstock for plum cultivars.

### 6.2.4 *Alu Bokhara Amritsari*

Large sized fruits of attractive red color having high TSS:acid ratio. Free stone, pink colored flesh with uniform sweetness. Free from sourness near the pit, the serious most drawback of Indian plums. The maturity period is also quite earlier as compared to those of temperate plums [37].

### 6.2.5 *Titron*

Fruit medium in size with deep purple, thin skin and yellow flesh. A self-fruitful variety and the yield improve when planted with 'Alucha Early Round' as pollinizer. The fruits ripen in second week of May. Average yield is 25–30 kg/tree.

### 6.2.6 *Jamuni Meeruti*

Fruits are small in size, dull yellow, thin skinned with soft melting flesh. The fruits ripen during end April. The average yield is about 28 kg per tree.



#### 6.2.7 Kataru Chak

A partially self-fruitful variety but the yield improves when planted with 'Kala Amritsari'. Fruits are large, purplish with creamy flesh. They are good for jam and squash making.

#### 6.2.8 Alu Bokhara

A self-unfruitful variety and should be planted in rows alternating with 'Howe'. Fruits are large, yellow in color sometimes having red over color.

#### 6.2.9 Howe

The fruits are large, round, sweet juicy and red at maturity. Fruits ripen in second fortnight of May yielding on an average 30–35 kg fruit per tree. Interplanting of Alu Bokhara helped to increase yield.

### 7. Conclusion

Stone fruits or *Prunus* spp. are deciduous tree species originating from the temperate zone of the northern hemisphere. Plum, peach and nectarine, sweet and sour (tart) cherry, apricot and almond belongs to the group of stone fruits according to pomological classification. The genus *Prunus* has a vast species and varietal biodiversity expanded world over as wild, semi-wild and cultivated forms. Considering the significance in terms of its share to the plant biodiversity, genetic resources and horticultural utilization, it becomes very essential to create repositories, to generate data base and to adopt collaborative conservation strategies to mitigate the threats to this genus. Stone fruits typically have long breeding cycles; thus, developing a new cultivar through traditional breeding may require many breeding cycles and dozens of years. Major efforts in stone fruit breeding has been done in early twentieth century, however major progress was achieved in the second half of the twentieth century, with uneven results which differ from less effectual (in apricot) to extraordinarily successful (in peach and nectarine).

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