

PRODUCTION AND PRODUCTIVITY OF APPLE INDUSTRY IN J & K

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Apple is probably the most ancient fruit primarily grown in Asia and Europe and then brought to North America. A variety of myths, stories and facts about apple can be found in Greek mythology; like the famous one about the forbidden apple of the Garden of Eden in the Holy Bible. Apple is rich in fibre, Vitamin C, antioxidants, flavinoids and calories. Apple was cultivated in Central Asia, first in 1865. Recently, China is the leading producer of Apple amongst other producers across the globe. Nevertheless, Kashmiri Apples hold a unique identity in global arena. This chapter describes the origin of apple, uses of apple, apple production, area, productivity, import and export in the study area, India and the world.

• ORIGIN OF APPLE

More than eighty million tons of apples are harvested annually in the world, and the number of varieties of this fruit exceeds seven and a half thousand. Scientists have known for a long time that the mountain forests to the west of the Tien Shan, on the territory of present-day Kazakhstan and Kyrgyzstan, were the birthplace of the cultivated apple tree. Recently, a study has emerged that reveals new details of the history of the apple tree. In particular, the author came to the conclusion that the evolutionary changes that eventually led to the emergence of modern apple trees began in their wild ancestors even before people paid attention to these fruits.

Two years earlier, a team of scientists from China and the United States managed to clarify the history of apple trees, comparing the genomes of 117 varieties of cultivated apple trees and 20 wild apple species. The researchers confirmed that the main ancestor of the

domestic apple tree (*Malus domestica*) was the Sievers apple tree from Kazakhstan. Later, when apple trees spread westward along the Great Silk Road, they interbred with local species: in Siberia - with a berry apple (*M. baccata*), in the Caucasus - with an eastern apple tree (*M. orientalis*), in Europe - with a forest apple (*M. sylvestris*). Approximately 46% of the genome of modern apples is inherited from the Sievers apple tree, and 21% from the forest apple.

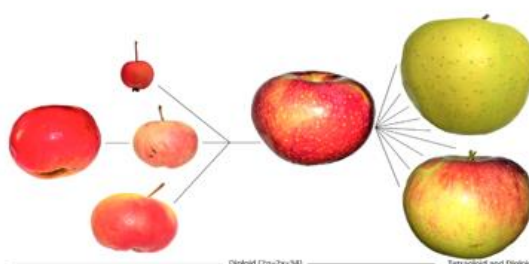


Figure 4.1 Different apple varieties

On the far left is the Sievers apple tree, further on top - the berry apple tree, in the center - the eastern apple tree,

below - the forest apple tree. These four species were the ancestors of the domestic apple tree, which later gave rise to many different varieties.

In the other direction of distribution of apple trees from Central Asia - to the east, to China, they also crossed with local species, the genetic traces of which are preserved in some Chinese varieties. East Asian apple trees, which are now considered independent species: the plum apple tree (*M. prunifolia*), known to Russian gardeners as "Chinese") and the Asian apple tree (*M. asiatica*), probably arose as a result of hybridization between the Sievers apple tree and the Siberian berry apple tree.

Apples have been around for centuries in India. Although during the British ruling time, their entry into India was introduced, the nation had long since borne fruit -N. 78, stated by Jayapalan in his book entitled as, "The Economic History of India," that the Muslim ruler Firoz Tughlaq grew apple trees in the Delhi neighborhoods throughout his life in 1309-1388. Centuries later, when the British came and planted apple trees in the north, their reception was poor for the taste of sour crab apples. It was only in the early 1900s, when Samuel Evans Stokes from Philadelphia came to India - bringing with him a few seeds from sweet apple varieties - which Himachal Pradesh farmers celebrated and the apple industry in India exploded.

But there are still various ancient records that the cultivation of mild fruits such as apples is about 3,000 years old. Kalhana in Rajtarangni mentions this during the reign of King Nara in 1000 BC. One of the most famous places for growing apples in the Kashmir Valley is ChuntVar, because there are many apple orchards. Fruit trees were then planted along roadsides and randomly on agricultural fields and slopes to provide shade and food. The local origin of different species and varieties is responsible for the reproduction of temperate fruits. It happens that when birds and animals eat the pulp of the fruit and throw the seeds on the ground, they stratify with forest debris and snow cover, which results in recovery under natural conditions. Palweth - Kashmir's Ambri apple and a number of others are available examples.

• **APPLE VARIETIES**

More than 113 varieties of apple are found in India. A few of the most popular apple fruits are discussed below.

• **Delicious (Red Delicious)**

It is one of the most popular apples found in Kashmir, one of the 15 most bought varieties by Indian. An early fall variety that the public became aware of in the late 19th century, when farmer Jesse Hiatt from Iowa sent the apple to a competition in 1880, calling it a "hawk's eye."

A very beautiful, usually large in size, intense red color, and calmly sweet it is. A lot of juice, but the flesh is often mealy. Red Delicious is good at savory appetizers and salads. It has a thick, rough peel, thanks to which, however, the apple easily tolerates transportation. This variety ripens in late October and it remains fresh for a longer period of time and gets sweeter with time.

Fruit weight 100-300 grams.



Figure 4.2 Red Delicious Apple

- **Ambri Kashmir**

Ambri is the most popular and often considered to be India's indigenous apple variety, growing in the Himalayan mountains. Crispiness, fragrance, flavour, and beauty are all well-known characteristics. It has a blush red colour, a striped pattern, is medium in size, and has a conical shape. The production of this unusual apple has expanded in the Shopian and Kulgam areas, and a production farm of this unique apple can also be found in the Batote district of Jammu.



Figure 4.6 Ambri Apple

- **Kesri (Cox's Orange Pippin)**

An old English medium-sized apple with a spherical to conical form and an orange red skin that deepens to a vivid red colour. Yellow meat that is firm, crisp, sensitive, and 81 juicy. The fruit matures in mid-August and has an excellent perfume and a sub-acidic taste.



Figure 4.8 Cox's Orange Pippin

- **CLIMATE REQUIREMENT FOR APPLE CULTIVATION**

- The key component that influences the development of apple fruits is the climate (temperature and sunshine). Apple trees, in general, require a minimum chilling period for optimal growth and fruit quality. For optimal growth and yield, 1000 chilling hours at temperatures below 7°C are recommended. The cultivar determines these conditions. The apple crop, on the other hand, will be harmed by the bitter weather. Growing apples necessitates a lot of sunlight because it is responsible for the development of the fruit's colour. Apples can be grown at elevations ranging from 1500 to 2600 metres above sea level (msl). During the growing season, an apple orchard requires an average temperature of 20°C to 25°C, as well as 100 to 130 cm of uniformly distributed annual rainfall. When there is a lot of rain or fog during fruit maturation, the apple fruit will not develop properly. Apples should not be grown in regions where strong winds are forecast.

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The key factor affecting the development of apple fruits is climate (temperature and sunshine). For best growth and excellent fruiting, apple trees typically require a minimum chilling period. For optimal development and yield, chilling for 1000 hours at temperatures below 7°C is recommended. Depending on the cultivar, these conditions will exist. The apple harvest, however, will be harmed by the bitterly cold weather. Growing apples necessitates a lot of sunlight because it is responsible for the development of the fruit's colour. Apples can be grown at elevations ranging from 1500 to 2600 metres above sea level (msl). During the growing season, an apple orchard requires an average temperature of 20°C to 25°C, as well as 100 to 130 cm of uniformly distributed annual rainfall. When there is a lot of rain or fog during fruit maturation, the apple fruit will not develop properly. Apples should not be grown in regions where strong winds are forecast.

- **Soil Requirement for Apple Cultivation**

- Apples may be cultivated in a variety of soil types. The optimum soils for this purpose are well-drained deep loamy soils rich in organic matter with a pH of 5.5 to 6.5 and good aeration. Commercial apple growers should have their soil tested, and any micronutrient gaps in the soil should be filled depending on the results.

- **Land preparation for apple cultivation**

For commercial apple growing, the land should be well-drained and deep, with an appropriate plan designed. Deep plugging and weed removal from past crops will help to level the proposed layout. If you are planning to grow apples commercially on a large scale, you should do a soiltest to determine the soil fertility and compatibility. As part of soil preparation, any missing micro nutrients should be given in addition to organic matter.

- **Planting apple cultivation**

When it comes to planting season, apple trees are most commonly planted in January and February. The square or hexagonal planting technique is used in apple growing. On the slopes of valleys, the contour planting approach is used. Pollinators must be planted between the main plantation and the apple fruit to ensure good fruit set. Dig trenches measuring 1 metre x 1 metre x 1 metre for planting. Each pit should contain a 35 kg mixture of well decomposed farm yard manure (FYM), 500 grams of single super phosphate, and 50 grams of malathion dust. Irrigation begins shortly after the planting is completed.

- **Propagation of apple is mainly done by budding**

Apples are propagated primarily through budding and tongue grafting. Based on the various forms of planting density, an average of 83 plants are planted per hectare, with a range of 200 to 1250 trees per hectare. On the valley floor, the hexagonal or square planting scheme is used, whilst on the hills, the contour approach is used. Planting pollinator species such as red delicious and golden delicious in between the main species is the best way to ensure proper fruit setting. Pits of 1x1x1 m. are prepared for planting in the months of October and November. After correctly mixing, 30-40 kg of FYM, 500 g of single super phosphate, and 50 g of Malathion dust are added to each pit. Planting is completed after about a month, followed by watering. The foliar spray provides appropriate manures. Apples have a water demand of 114 cm.

- **HARVESTS IN APPLE CULTIVATION**

Apple orchards begin to bear fruit in their seventh or eighth year. However, it is entirely dependent on the cultivar chosen. An apple tree's economic life span is typically greater than 35 years. Fruit yield grows from the eighth to the eighteenth year and then remains stable (constant) for the next 30 to 35 years. Depending on the agroclimatic conditions and variety chosen, some cultivars can even produce apples after 35 years. Pick the fruits before they are completely ripe.

- **Harvesting and post-harvest management**

The time it takes to harvest an apple varies depending on the cultivar. The harvest season for red apples, for example, is from late September to early October. Fruit ripening and maturation are two distinct phenomena. The quality of an apple can be maximised if collected within the maturity period; nevertheless, the fruit may or may not be fully ripe and edible at the time of harvesting. The weather has a crucial part in determining when different varieties of apples are harvested.

Postharvest tasks in apple farming include pre-cooling, grading, storage, packing, transportation, and marketing. The immediate management of the crop or fruit following harvest is known as post-harvest. The following are the techniques utilised in post-harvesting are:-



- **Pre-cooling**

The practise of reducing heat from apples before packing and further processing is known as pre-cooling. Place the apples in a cool, well-ventilated area to achieve this. We can also keep the apples in cold water to keep them cool. Before grading, wrapping, or packaging in cartons, the fruit surface must be dry.

- **Grading**

Apples can be graded in three ways: fruit size, fruit appearance, and fruit quality. Apples are carefully rated in six grades based on their size. Apples are classified into three or more quality grades based on their colour, shape, and quality. AAA, AA, and A; A, B, and C are the most common designations for these grades. Mechanical graders with cleaning and waxing capabilities are now employed for size grading.

- **Packaging**

Apples can be packaged in a variety of ways. Apples are packed in wooden boxes in India. There are specified sizes of wooden boxes or cardboard boxes in various regions that can carry roughly 10 kg, 17 kg, and 20 kilogramme fruits in a box. 45.7 cm long, 30.5 cm wide, and 25.4, 27.5, and 30.5 cm high are the dimensions of wooden boxes. Apples are packed in CFB cartons as well.

These CFB cartons save wood and also preventing fruit bruising, resulting in a higher market price. CFB boxes with trays measure 50.4 cm x 30.3 cm x 28.2 cm and 50.0 cm x 30.0 cm x 28.2 cm, respectively (inner case)..

- **Storage**

The preservation and storage of fruits is the most important step in the post-harvest period, and in our initiative, we will educate farmers on better storage practises for keeping their crop. Apples have a longer life than other fruits, however the shelf life of different varieties varies. After the climacteric stage, apples begin to deteriorate. Apples, on the other hand, can have their shelf life extended by providing optimum storage conditions. Apples should be stored at a temperature of -1.1 -0 C. After harvesting, apple cultivars can be kept for 4 to 8 months.

4.5.6 Harvesting and Yielding Apples

The fruit is harvested before it is fully mature. The Kashmir apple has an average yield of 11-13 tonnes per hectare. After the apples have been gathered, they are placed in a cool, well-ventilated area to dry off. After that, the apples are assessed based on their size, quality, and appearance. Apples have a longer shelf life than any other fruit, ranging from 4 to 8 months after harvesting. Apples are typically packed in corrugated fiberboard cartons or wooden boxes.

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