

## Regional Peculiarities in Apple Production

*By*

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In the course of a recent survey of the apple growing industry in different parts of India, the author was struck with the amazing diversity of practices with reference to almost every aspect of apple production. Although characteristically a temperate zone deciduous fruit, the apple as grown in the different provinces and states of India has become adapted to such a great extent as even to be ranked as a commercial fruit to be grown amidst the tropical mango or citrus, as in certain parts of South India. The very wide diversity of conditions under which the apple is being produced is, therefore, a study of immense interest and has accordingly engaged the attention of the author. The present contribution is made with the hope that the varied features that are associated with apple culture in different regions of India may serve to bring out the immense possibilities for effecting improvements with due regard to the experiences of the particular locality and of those regions where entirely dissimilar conditions prevail.

It is an admitted fact that apple production is only a relatively minor industry in India, but one which has deservedly attracted much attention because of firstly, the scarcity of the fruit which leads to a wide disparity between the production and demand; secondly, it being a fruit that can stand travel to much greater extent than most others, its popularity as a commercial fruit has ever been on the increase; and thirdly, the increasing imports of the fruit during the pre-war days.

Despite the oft-expressed policy of every country fostering only such industries for which the natural conditions are most favourable, there is everything to be said in favour of stimulating such industries as that of the apple in most parts of India, if the policy would serve to assist the country to become self-sufficient in regard to the particular produce. With the apple, the policy of extension and improvement can be justified on both these grounds, since the country has regions possessing natural facilities in some measure as well as those wherein the production can be augmented without much effort and cost and with great economic advantages. The future of the industry can only be planned satisfactorily if its peculiarities are properly assessed; and it is on this consideration that the present attempt has been made.

**Area.** There are about 16,900 acres under the apple in India, distributed roughly as follows:- Kashmir 10,000; Kumaun Hills 6,000; Baluchistan (Quetta) 500; Kulu Valley 160; Simla Hills 120; Bangalore 60; Murree Hills 30; North-West-Frontier Province (Abbotabad) 20; and the Nilgiris 10 acres.

In Kashmir, the possibilities for extension are almost unlimited. In the Kumaun Hills, land suitable for apple cultivation is restricted due to the nature of the terrain and the general unfavourableness of the summer weather. Any appreciable increase in the Kulu Valley will be only possible with a marked improvement in the existing transport facilities. The Simla and Murree Hills should not have much difficulty in expanding their apple industry if conditions there are as favourable as they are reported to be. It may not be possible for Quetta materially to augment its existing area due to prohibitive production costs. Abbotabad, Bangalore and the Nilgiris appear to be climatically unsuitable for the optimum growth of the apple. This may restrict the choice of varieties to a few which are hardy. But it is very unlikely that they will compare well with the types under commercial cultivation in other more favourable parts of India and may therefore, only serve at best the needs of a purely local market.

**Climate.** The apple requires considerable winter cold to release it from dormancy and is therefore, pre-eminently a temperate zone fruit suited to regions which have a low winter temperature attended by snow fall. High temperature adversely affect the quality of fruit and for this reason the best apples are characteristic only of tracts with a mild summer weather which is warm but not hot. Judged by these standards, in India, the cultivation of this fruit should be successful in tracts whose maximum temperature is between 90°F. and 100°F. and the minimum from 24°F. to 30°F. Kashmir, Quetta, the Kumaun Hills, the Kulu Valley and the Simla and Murree Hills are well within these ranges; and it is not unnatural, therefore, to see the largest areas under the apple concentrated in these tracts. Abbotabad, while meeting to some extent the requirements of winter cold, has too hot a summer. The Nilgiris and Bangalore have at best only a mild winter with a temperature above 30°F. These places can never, therefore, aspire to become important apple growing centres.

The apple likes an annual rainfall ranging between 25 and 30 inches, though it can bear with much less or tolerate far more. What is important, however, is its distribution during the year. Heavy summer showers are harmful to the developing fruits and hailstorms cause great damage. This feature is the greatest deterrent factor on the Kumaun Hills. Late autumn rains delay the movement of the trees into dormancy and an insufficient winter rest is reflected in the succeeding poor spring growth and blossoming.

Heavy snow falls are injurious unless the trees have been carefully pruned to provide a strong frame-work. Late spring frosts by their scorching effect on leaf and blossom are particularly detrimental to early flowering varieties.

No apple tract in India is in the fortunate possession of all the desirable climatic features indicated above. But by a judicious selection of varieties, bearing in mind their blossoming and fruiting periods, a proper choice of aspect, site and soil, and a careful building up of the frame-work and the provision of irrigation and drainage where these are necessary, much can be accomplished in places declared unsuitable after a superficial assessment of the climatic factors.

**Soils.** The apple grows on a variety of soils ranging from the deep loams of Kashmir, the light loams of the Kulu Valley, the brown sandy forest soils of the Kumaun Hills to the stony infertile soils of Quetta. Though it is able to adopt itself to such diverse soil types, it can thrive only if unfavourable factors are modified suitably. The deficient moisture content of sandy soils in summer months must be made good by irrigation. Infertile soils should be frequently manured to meet the needs of the trees. In Abbotabad and the Kumaun Hills, the apple tree is prone to root-borer attack on sandy or sandy loam soils and prophylactic measures may be necessary to keep the trees free from it. In any particular locality, however, where a choice among different soil types is available, a deep heavy loam is to be preferred to all others.

**Varieties.** The choice of the varieties to grow in any particular tract is conditioned by several factors. First, there is the suitability of the climate to be taken into consideration. While in temperate tracts like Kashmir or Kulu, most apple varieties may do well, in places like Bangalore or the Nilgiris, the range of varieties that would grow is restricted to those that are only sub-tropical in their requirements. On these grounds, for example, it is seen that while varieties like Rome Beauty fare well at the latter places it is manifestly impossible to expect success with a purely temperate variety like Cox's Orange Pippin. Secondly, as circumstances exist now, certain varieties, though naturally adapted to a tract, may not thrive due to their susceptibility to pests like the woolly aphis, if it has established itself there. There is no better example of this feature than on the Nilgiris. Rome Beauty, Winterstein and Edward VII are varieties which would thrive in this region except for their extreme susceptibility to the pest which renders the trees unthrifty and unprofitable to cultivate. As measures to control the pest or to inculcate some degree of resistance in these varieties involve several time-taking devices, the choice in the first instance requires to be restricted to blight-resistant types such as Irish Peach, Carrington, and Allsop's Early. Thirdly, where conditions permit of a wide choice of fruits to grow, it becomes an economic necessity to limit the choice of apple varieties to those that would yield better returns than other fruits. An instance to illustrate this is available in Kashmir, where the majority of apple growers prefer the indigenous Ambri to all others, for its superior yields bring in an income larger than closely competing crops such as



pears, cherries and walnuts. Fourthly, the varietal selection also depends upon the market which absorbs the produce. From Kashmir, the produce is easily transported and as such, bulk consignments are despatched with facility to markets in Bombay and other large cities. The consumers in these areas are largely Indians who prefer the sweet Ambri to the sub-acid English or French varieties. In contrast, the Kulu apples reach the consumers directly from the place of production as transport in bulk is beset with difficulties and the crop has therefore to be consigned in small lots. This has made it possible to cater to the Europeans scattered in different places in India who prefer the sub-acid fruit of the foreign varieties they have been accustomed to. The consequence of this chain of factors is, that while in Kashmir the Ambri is the predominant variety under cultivation, in Kulu, English, French and other foreign varieties hold the field. Finally the selection of varieties depends on several other factors such as late blossoming to avoid spring frosts, sturdy growth to sustain the weight of snowfall in the winter and resistance to drought where natural rainfall is low and water sources inadequate.

It will thus be seen that the final choice of a particular variety or varieties in any tract has to be made after giving due consideration to several independent and intermingling factors. Out of experience over several decades, each of the apple-growing tracts in India has on hand a list of the best varieties to grow. This is given below but is by no means final, and will, no doubt, be added to, from time to time. The names of the varieties have been recorded as they were given to the author in each of the tracts he visited.

Kashmir: Ambri, French Red, Russett, Cox's Orange Pippin, Mackintosh, Pearmain, Ribston Pippin, Golden Russett, Esopus Spitzenburg, Northern Spy, Mr. Gladstone and Blenheim Orange Pippin.

Kulu Valley: Red Delicious, Black Ben Davis, Golden Delicious, Cox's Orange Pippin, Granny Smith, Baldwin, Stamford Pippin, Red MacIntosh, Yellow Newtown, and Red Astrachan.

Kumaun Hills: Red Delicious, Jonathan and Rymer.

Quetta: Varieties going by the name of Kulu and Kashmir but apparently unidentified.

Bangalore: Rome Beauty.

Coonoor, on the Nilgiris: Irish Peach, Allsop's Early, Carrington, Signe Tillisch, Zouche's Pippin, Rome Beauty, Winterstein and Edward VII.

**Stocks and Propagation.** It is interesting to note that nowhere in India are apple orchards built up from seedlings. Vegetative propagation of varieties on some rootstock or other is universal.

The rootstocks in use are varied and peculiar to each tract. In the more important apple-growing tracts such as Kashmir and Kulu, though the existence of clonal rootstocks is known, seedling stock is common, as it is a general belief that the former are not essential to ensure uniformity in the orchard population. The seedling rootstocks in use are generally of the wild apple varieties, occurring in each tract, which are mostly known by local names. It should prove an interesting study to describe these in detail and assign them to the particular botanical species to which they belong. In Kashmir, the wild indigenous apples are known as 'trels' and the two types recognised are 'Buth trel' and 'Kichahama trel'. In Kulu again, the crab seedling is generally used as stock, but it is not known if this is an imported type or indigenous to the tract. In Quetta, two varieties of the local wild apple known as 'Shakar Sheb' and 'Jungli' are utilised. In Kumaun, the general practice is to collect seed of any apple available and use it for raising seedlings for stock. In Bangalore, the original apple plantations were all raised on the imported crab stock. But the industry failed due to the infestation of the stock by the woolly aphid. Thereafter, the resistant rootstocks were brought into use and most of the apple orchards now consist of scion varieties on resistant Northern Spy stock. On the Nilgiris, again, the existing area of apple is on the crab stock.

The importance of clonal rootstocks and of those that are resistant to pests and diseases has not yet been sufficiently appreciated except in tracts like Bangalore and the Nilgiris where probably, apple cultivation would become extinct without such stocks. In the more favoured tracts, the perceptible effects of their use are not likely to be spectacular but are bound to improve on the present position. For instance in Kashmir, the standard is the most popular system to which apple trees are trained and the utilisation of variable seedling stock often fails in this purpose. Clonal stocks of the very vigorous Malling XVI would eliminate this defect. In the Kangra and Kulu Valleys and in Quetta and the Kumaun Hills, it is admitted that the woolly aphid takes a fairly large toll of the yearly crop by the damage it inflicts on the growing buds. Here, root-grafting scion varieties to the immune Merton stocks may appreciably reduce the loss. In Bangalore and the Nilgiris, the apple fails to thrive when infested by this pest and the use of the resistant Northern Spy or Merton stocks is indispensable. Though the crab was replaced by Northern Spy in Bangalore, the position is still not very satisfactory due to the susceptibility of this stock to collar rot disease, and a further change-over to the Mertons or *Pyrus baccata* for resistance to both the pest and disease simultaneously is now being attempted. On the Nilgiris, orchard experience gained during the last three years has given indications that root-grafting apple varieties on the immune Mertons offers a promising combination immune to the root phase and resistant to the aerial phase of the woolly aphid pest.

For propagating the apple, shield budding is generally adopted excepting on the Nilgiris, where, in spite of repeated trials, the process has at best given only a success of about fifty per cent. The reasons for this are obscure but the climatic features may be responsible in some measure for this unusual feature. Whip grafting, on the other hand, gives almost one hundred per cent success in this tract, and the method, therefore, is in general use. It is also reported that grafting is fairly, commonly used on the Kumaun Hills. Of the other methods, bench-grafting is being given serious consideration, though the purpose varies in the tracts where it is being tried. In Kulu, for example, the prevailing nursery practice involves a period of three years from the time the seeds of the stock are sown to the stage when the apple grafts are ready. A reduction in this long period would cut down production costs considerably and an attempt is therefore now being made to root-graft apple scion varieties on root pieces collected from the base of old established trees. This process takes only one year for the preparation of an apple graft ready to go into its orchard site. On the other hand, as has been detailed before, on the Nilgiris, the root-grafting is of special applicability when varieties susceptible to the woolly aphid are desired to be propagated on the immune Merton stocks.

**Orchard Practices. Training:** The bush tree is generally preferred, excepting in Kashmir where the standard seems to be more popular. It is said that in Simla Hills also the trees are in considerable part, standard. This tree habit seems necessary to cope with the exuberant growth of the trees as also to enable the scaffold limbs to bear the heavy load of snow during winter in these places. The bush form in the other tracts is adopted to suit the higher summer temperatures which might scald the trunks of standard trees.

**Cultural Practices:** These differ from place to place depending on the climatic features. Manuring, intercultivation and irrigation are all adopted in a lesser or greater degree depending on the tree requirements. Kashmir alone presents some unusual features. To the apple grower in this region, manuring and irrigation are not of so much significance as the hoeing and intercultivation of the soil at least four times in a year. Every apple orchard is kept meticulously clean of weeds and ploughed in the alleys. But manuring is done, if at all, only once in the course of three or four years, each tree getting even then, only two or three bushels of cattle manure. Irrigation, again, is sometimes given only to young orchards in their pre-bearing age. These peculiar practices have been evolved through experience and are possible because of the natural fertility of the soil and the adequate yearly rain and snow fall.

**Pruning:** Nowhere in the apple growing tracts of India are orchards pruned to a definite method. Largely, the process resolves

itself into building a frame-work in the early years and the removal of dead, diseased and crossing limbs later. It appears as though a more rational system for the various varieties could be formulated if careful trials are conducted. Singh R. S. (Pruning of Deciduous Fruits—U. P. Dept. Agri. Fruit Series Bulletin, 18, 1937, p. 5) has described a system of pruning apples but it does not seem to be practised in any of the apple-growing regions in India. At Coonoor an annual tipping of leader and lateral shoots in a pronounced non-spur bearer viz., Winterstein, has recorded even up to 14 per cent increased yields over unpruned trees. With suitable variations in the details, it should be possible to devise pruning systems suited to different varieties in cultivation at different places.

✕ *Fruit thinning*: Fruit thinning as a measure of preventing the exhaustion of heavy bearing trees and for the increase in size of individual fruits is a normal practice in Kashmir, Kulu and the Kumaun Hills. The severity of thinning varies in the different places. While in Kashmir and Kulu the thinning is done on empirical lines, in Kumaun, work at Chaubattia has shown that the early varieties should be thinned thirty days after full blossom while with the later varieties the period may be extended by another ten days. It has also been found here that, in the former group, thinning should be restricted to leave one fruit to 30 leaves and with the latter one fruit to 25 leaves. At Coonoor, attempts at thinning one of the few prolific varieties, Irish Peach, resulted in severe restriction of the crop without tangible increases in fruit size. It thus seems necessary to determine the effects of thinning for each tract independently.

*Yields*. Perhaps there is no other character of the apple which differs so widely in the different tracts as the estimated yield. In Kulu, it is reported that yields up to 1,250 pounds have been recorded annually. The estimate in Kashmir is 150 pounds per tree which appears too modest considering the eminent suitability of the tract to apple-growing and the large size to which the tree grows. The figure, more likely, represents the average for the State on the basis of the total number of trees which would include young and non-bearing plants. The average yields cannot be far inferior to those for Kulu. The bearing propensities of apple trees in Quetta and Kumaun are decidedly on a lower scale than in either Kulu or Kashmir and an average yield per tree per year of about 100 pounds may not be far from reality. At Bangalore and Coonoor, the apple performs poorly, the orchard average, perhaps, not exceeding 25 pounds per tree per year.

*Longevity*. The economic orchard life of apple trees in Kulu and Kashmir is reported to be more than sixty years. In Quetta and Kumaun Hills, forty years is a fair maximum. In Coonoor, the profitable life of a tree extends only up to about 25 years, while at Bangalore it is even less, being only about twelve years.



**Pests and diseases.** The pests and diseases to which the apple is subject, in so far as the northern territory is concerned are more or less the same. The woolly aphis, root and stem borers and the San Jose scale among pests, pink disease, collar rot, stem black, and stem brown among diseases, are some of the major enemies. In the South at Coonoor, the woolly aphis and pink disease and lately the San Jose scale are the only three which have assumed serious proportions, while at Bangalore, in addition to these, the collar rot is also of importance.

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[ *Author's Note:* Since the writing of this article, there have been changes in the constitution of some of the provinces, and some of the regions such as Abbotabad and Quetta now form part of Pakistan. But since the survey was made of the provinces as a whole and the subject was dealt with taking India as a unit as it then existed, it is felt that the presentation of the material as collected would be the best, instead of trying to recast it to fit it into the revised boundaries. ]



### **D. D. T.**

D. D. T. has been found a cheap and effective means of control of the two pests that attack linseed crops — *Heliothis Armigera*, (a caterpillar known also as the tomato grub, corn-car worm, cotton boll worm or lucerne caterpillar), and the red-legged earth mite. The *Heliothis* caterpillar is controlled by dusting either from the air or from power dusters mounted on jeeps or trucks. The rate of application is 12 lb. to the acre of 5 per cent dust, or 30 lb. to the acre of 2 per cent dust. Where crops are being grown under contract, the purchasers have arranged to dust crops from the air at their expense, the farmer being only responsible for the cost of the D. D. T. dust used. Usually only one treatment is necessary. Crops are dusted about 10 days after they come into full flower by light aeroplanes which trail the insecticide in 30 foot strips. To protect crops against the earth mite, farmers mix D. D. T. with super-phosphate and apply it through a seed drill or fertilizer. After a few weeks, when the mites have been killed, the super is worked into the soil. (Agricultural News letter No. AGN/216).