Chapter 1

I N T R O D U C T I O N

India is the third largest producer of tobacco in the world producing 4.5 lakh tonnes annually which is about 7 per cent of the world production. It is one of the most important commercial crops of the country as it fetches Rs 350 crores or 10 per cent of the gross value of India's agricultural output. The annual consumer spending on annual gross tobacco product is of the order of Rs 2700 crores made up of 1300 crores in biris Rs 850 crores in cigarettes and the remaining Rs 550 crores in cigards, cheroots, hookah , snuff and chewing tobacco etc. In general, two types of tobaccos, viz., Nicotiana tabaccum and Nicotiana rustica are produced in the country. From commercial point of view Nicotiana rustica is the prominent variety as it has distinct characteristics and uses.

It is essential to have the product of high quality for maximum economic return as the consumers of tobacco products are very much quality conscious. The quality of tobacco depends upon the process of curing which essentially consists of gradually drying it under particular conditions of temperature, humidity, and air supply and storing it for

cure. The process begins at a temperature of 30 to 32°C with a gradual increase to 37 - 40°C, 54 - 56°C and 80 - 90°C during yellowing, colour fixing, laminar drying and stem drying stages of curing respectively. Relative humidity is maintained between 70 to 85 per cent depending upon the variety of tobacco. The curing brings about certain changes in chemical composition which are essential for the development of the desired quality. During curing, green granules disappear and starch gets converted into gum and sugar. The decomposition of starch and sugar in the leaves and oxidation of tannin into dark brown insoluble substance also takes place during curing. The carbohydrates prove to be the most reactive and undergo considerable changes including important organic constituents like nitrogenous compounds, organic acids, polyphenols, pigments, oils, resins, enzymes and mineral constituents.

Depending on the type of tobacco, the method of harvesting and the maturity of the leaf at the time of harvest, four principal methods viz., flue curing, air curing, fire curing and sun curing are being used. Fire wood or other agricultural waste is used in flue and fire curing. Solar energy, naturally available, is used for sun curing.

Energy available from the sun is in the order of 1.352 KWH/m^2 in the atmosphere out of which about 0.78 KWH/m^2 received on earth may be put to use. Several

scientists have worked on the development of methods for curing of tobacco using solar energy. They have also opined that solar energy system could be utilized very safely and economically for curing of tobacco. It has been found that solar assisted curing system required fuel consumption of the order of 0.3 kg per kg of dried tobacco as against 0.4 to 0.8 kg per kg in case of conventional barn systems. In other studies, it has been indicated that a multi-chamber solar curing system could effect fuel saving upto about 50-70 per cent as compared to commercial barns. So far, no systematic approach has been made in India to utilize solary energy effectively for curing of tobacco.

Chewing and hookah tobacco, is grown in about 42 thousand hectares in North Bihar, India and it is the most important commercial crops of the region. In view of the above facts, an investigation was undertaken to see the feasibility of solar assisted curing without affecting the quality of the product.

The main objectives of the study were the following -

i) To evaluate traditional and improved curing processes using using naturally available solar energy.

ii) To study the process conditions and characteristics of curing tobacco by different methods.

iii) To evolve an optimum intermediate technology package

for improving tobacco curing with solar energy.

iv) To test the relative effectiveness of the systems in terms of quality of the product.

Four varieties of tobacco, harvested by stalk cutting and stripping were cured by three different methods of on-farm curing viz., ground curing, open scaffolding and covered scaffolding. The data collected were statistically analysed and the best fit relationships were represented by exponential, logarithmic or power models to see the effects of method of harvesting and curing. The quality characteristics of resulting tobacco were determined to test the superiority of the particular set of methods.

Effort was also made to study the single leaf and whole plant drying of tobacco in a laboratory dryer and find the drying characteristics of green, matured leaf or single plant tobacco. Resulting quality of the product was tested after due curing.

A solar collector dryer was designed, fabricated and used for curing the tobacco samples with the help of solar energy. The efficiency of the method, from the point of view of saving the fuel and physico-chemical quality of the resulting product was estimated. In this case also the three mathematical models were applied to judge the superiority of the particular temperature-humidity treatment given with the help of the solar dryer.