

THE TECHNOLOGY OF TEA.

NEUVILLE, H.—Technologie du Thé. Composition Chimique de la Feuille. Récolte et Manipulation. Procédés Européens. Procédés Asiatiques.—Seconde édition: révisée avec le concours de la Station expérimentale d'études sur le Thé de Buitenzorg (Java). Paris, 1926. Pp. 304, + 28 plates.

The technology of tea has made considerable progress during the last twenty years, and numerous researches have been carried out on manufacture, but the accounts of these researches and the modifications in manufacture are disseminated through a large number of journals. The object of the author has been to collect the data thus obtainable concerning the chemistry and manufacture of tea, and to present this in as simple a way as possible so as to make it of universal interest. The result has been an eminently readable account of the facts concerning the chemistry of the leaf, withering, rolling and all the processes involved in the art of tea-making, together with a description of the machinery employed, supplemented by excellent photographs and several plans. As was to be expected the author cites the results of the Java workers to a great extent, and it is not quite certain to what extent it is desirable to generalize on all the points made.

The first part deals with the structure and composition of the tea leaf, and includes a review of the methods of analysis. The principal constituents in tea are given as tannin, caffeine, glucoside and essential oil, while protein and other substances like theophylline,

xanthine and carbohydrates are mentioned. Although tannin plays such an important part in tea it is surprising how little is definitely known about this group of chemical substances and their decomposition products. Tea tannin appears to correspond to a formula $C_{20}H_{20}O_9$, containing one ketone and eight hydroxyl groups in the molecule, and it is placed in the group of oak tannins on account of the formation of red compounds (phlobaphenes) when boiled with acids. It readily undergoes oxidation with the formation of red and brown insoluble products, which are however soluble in an aqueous solution of tea tannin, and these substances are supposed to account for the colour of tea.

The manufacture should not be conducted in an empirical fashion, but should be controlled by the use of thermometers and hygrometers; and in the case of withering, the degree of wither should be determined by actually weighing leaf samples, while records of temperature and humidity should be kept for reference.

The wither should not be too rapid, 12 hours being regarded as a minimum while 18 hours is considered the best period. High temperatures are to be avoided, and if hot air is used it should be well mixed with fresh outside air, while the lofts should be as open as possible during the day to admit fresh air and to get rid of any stale aroma. It is advised that the fine leaf be withered apart from the coarse leaf as far as possible, owing to the tendency of the fine leaf to dry out too rapidly. It is important to wither the leaf so that the concentration of the sap is nearly the same each day. The loss of weight on withering will therefore depend on the moisture content of the leaf.

The essential part of the rolling is to bruise the cells of the leaf and to allow blending of the contents so that the several substances in the cell sap can react with each other, while some of the juice is squeezed on to the outside of the leaf. The reactions concerned, however, can proceed within the leaf itself. At the same time the leaf is given a twist, and undoubtedly fermentation also proceeds during the rolling, which must be carried out with great care. The roller should be filled in small quantities at a time, the pressure applied gradually and the cover eased periodically to keep down the temperature inside the roller.

Fermentation, which proceeds best at a temperature of $20-25^{\circ}\text{C}$., is very slow at low temperatures, but temperatures above 30°C . are unfavourable to the fermentation as the aroma becomes less agreeable, and a portion of the soluble fermentation products are rendered insoluble. During the process the tannin undergoes considerable changes, with the formation of bodies which give strength and body to the infusion, while the essential oil is developed. Air is necessary for the spontaneous chemical transformations which take place during

fermentation, but drying of the leaf during the process should be prevented by maintaining an almost saturated atmosphere in the fermenting room. The temperature of the atmosphere, the humidity, the quality and moisture content of the leaf, together with the locality and time of the year, are factors which contribute to the duration of the fermentation, so that the actual time required is determined by experience gained in judging the colour and aroma of the leaf. The presence of an enzyme system consisting of oxidase and peroxydase has been definitely demonstrated in tea leaf, and these enzymes play an important part in the fermentation, contrary to the idea that microbes normally take part in the process.

The essential rôle of drying is to arrest the fermentation, but a few modifications occur depending on the temperature employed, which should be regulated by means of control thermometers. High temperature desiccation is attended with loss of quality, and prolonged drying renders some of the constituents insoluble.

The last section deals with the preparation of tea in China, Formosa and Japan, together with a classification of these teas, and ends with a useful bibliography of the literature relating to the chemistry and technology of tea. The volume is a distinctly needed and useful compendium for those interested in the subject, and the author is to be congratulated on the readable, if not very orderly, account of the great mass of work in the many fields involved.

D. I. EVANS.

ENQUIRY.

We have received a request from Java for seed of a small-leaved hybrid jat of tea which does *not* flower abundantly.

We shall be pleased to hear from any one who can supply this, and to put them in communication with the applicant.

T. PETCH.