after application of the optimal concentration, which varied from 0·02 to 0·005 % according to species. An interesting result was achieved with *Picea excelsa*, the cuttings of which are difficult to root. Cuttings made in June and treated 24 to 32 hours with 0·005 % solution of heteroauxin rooted up to 93 %. The effect of phenylpropionic, phenylacetic acid, anaphthalene acetic acid, urine and maize flour extract was similar but less pronounced than that of heteroauxin. The compounds proved ineffective on some species. The effect of growth substances depends on the plant species, age of plant, wood development and time of taking cutting. (*Horticultural Abstracts* 9 (1939) : 6)

EXTRACTS

Silage making by the Forest Department. The Forest Department experimented for the first time in Kurnool District with making of silage to serve as fodder for cattle during the hot months.

Two pits were dug each 10 feet by 15 feet and eight feet deep in Sidhout and Vontimitta Ranges of this Division. These pits were filled with green grass on 29th September 1938 and 21st October 1938 respectively.

In the pit in the Sidhout Range, 11·02 tons of fodder grass *Heteropogon contortus* (spear grass) and *Schema nervosum* (*nendra* grass) were put in. The weather was wet at the time of collection and of filling in of pits and the pit had to be covered with a tent to prevent rain getting in.

In the pit in Vontimitta Range, 10 tons of grass were loaded mostly *Heteropogon contortus*. The weather was not so wet in September and that probably accounted for the difference in weight in the two cases, the dimensions of the pits being the same. Grass was well pressed in the pit and trampled by cattle. In the green state, it stood two feet above ground level. Earth was banked on four sides and a top covering of two feet of earth laid, after all the grass had been loaded, to make the pits water-tight. Gradually the pit contents shrank to about six feet depth from bottom with the weight of the load of earth on top. The earth was shaped pyramid fashion to drain off water on all sides.

The pit in Sidhout Range was opened on 13th April 1939, i. e., eight months after formation, to see what the silage was like. About 100 cattle were brought from neighbouring villages to feed on the silage. The cattle greedily ate the silage offered. The Deputy Director of Agriculture who was present when the pit was opened pronounced it to be quite good.

The grass in the pit when first opened was quite warm to the touch and had a sweetish, tobacco smell—not quite offensive and yet not pleasant.

The cost of construction was as follows;—

Construction of pit	Rs. 7—4—0
Collection of green grass at annas four per bundle of 150 lbs.	Rs. 41—3—0
Covering, etc.	Rs. 4—0—0

The silage taken out was offered free to cattle that were invited to the feast. Quite three-quarters of a ton was thus distributed free. The balance—about 6 tons—was sold to ryots who readily purchased it at nine pies per 60 lbs.

The only criticism which the Deputy Director had to offer was that we did not cover up the top and sides of the grass heap with mat or green leaves to prevent soil mixing with the edible silage.

We propose to try making silage with bamboo leaves and *Yepi* (*Hardwickia binata*) in other centres. From the way the ryots appreciated this demonstration, it looked as though it would not be difficult to persuade the influential ryots in

forest villages to try this method of storing green fodder in time of scarcity. If our experiments with bamboo and *Hardwickia* also succeed, it should not be difficult to get a little revenue too by this method of preserving green fodder for cattle.

The Deputy Director of Agriculture lucidly explained in Telugu the method of forming silage and its use in times of scarcity. (*The Indian Forester*, LXV (1939) 582—583).

The Cultivation of Cinchona in India. It appears probable that we shall soon be having a big development in the cultivation of cinchona in India. Towards the end of the year 1937 it may be recalled that the Imperial Council of Agricultural Research, set on foot an enquiry into the prospects of cinchona cultivation in India and appointed Mr. A. Wilson, Deputy Director, Cinchona, Madras to conduct the enquiry and also associated with him Dr. T. J. Mirchandani, Agricultural Chemist, Bihar, as Soil Chemist. The Report of these officers which has just been published as Mis. Bulletin No. 29 of the Council, goes fully into the subject, giving an account of the present situation and prospects and an equally interesting survey of the nature and extent of the efforts in the past. It may not be generally known that India is already a fairly large producer of quinine from locally grown cinchona bark and that in the past it was producing much larger quantities. The present annual production is put down as some 70,000 lbs. of quinine; until about the year 1880 she was a much larger producer, the estimated quantity of bark per year at that time being as much as 950 000 lbs, or an output of nearly 2 lakhs pounds of quinine—facts which amply demonstrate that India has the soil and climate suitable for producing a large quantity of her requirements of the drug. This important factor, viz, India's requirements, is estimated variously. The author estimates it at 6 lakhs of pounds. He also refers to other authorities who estimate it at 12½ lakhs of pounds or over twice the first estimate. This is further complicated by the fact that in reality, India is consuming only 210,000 lbs. per year or only a third of the lesser of the above two estimates. An account is also given of the difficulties which the Government met with, in disposing of their stocks; comsumption fell from 80,000 to 60,000 lbs. even though prices became cheaper by 30 per cent. and the demand could not be increased even when the stock was offered for sale at a big sacrifice in price. Altogether we cannot help thinking that this matter of the quantity which India will absorb is decidedly obscure and needs to be clarified. We wish also that a statement had been furnished to show the consumption per year for a period of, say the last 10 or 15 years. Anyhow the report takes 210,000 lbs. of quinine as the annual requirement; of this quantity local production supplies at present 70,000 lbs. and the remainder is imported. The immediate objective therefore is to grow enough cinchona in the country to produce this 140,000 lbs. of quinine that is now imported. The report further envisages the need for producing the much larger quantities referred to above and contains suggestions to that end also.

Land considered promising for cinchona cultivation in many parts of India, notably the planting districts of South India, Assam, Bengal and Orissa, and the Andaman Islands have been surveyed, soil analyses and profile studies made, and the requirements in this regard discussed.

Altogether, an area of some 38,000 acres have been specified as suitable and additional tracts are indicated for further similar inspection, if a much larger production should be contemplated, though for the planting programme of twelve years at the rate of 3.333 acres annually stated as required for the latter larger production, this 38,000 acres appear sufficient. Government planters and small holders are all suggested as suitable agencies for the growing of the plants. We

may point out in this connection that no information to show what money return can be expected from the cultivation of cinchona is available in the report, although this is an all-important factor, at least as far as the private planter is concerned whether large or small. The cost of production is however given in detail; a statement of the prices paid for bark, or the unit price that has ruled for the last ten years or so, will have greatly added to the usefulness of the report. We should also like that analyses had been given of the soils of certain Anaimalai estates where bark with a high quinine content of 11% was being produced, and likewise of the soils of the Tavoy plantations which are stated to have been a disastrous failure although the area was selected by one of the greatest experts in cinchona.

The species *ledgeriana* is the one recommended to be grown. It is gratifying to learn that 72% of the cinchona grown in India at present is *ledgeriana*, and that among these some extraordinarily good areas may be seen. The need for research is emphasised on the famous Java model and a strong plea put in for a research station for isolating better performing strains of *ledgeriana*, for their multiplication as plants on their own roots or grafted on to *succirubra* stocks, for nursery technique and so on. Such a station is in our opinion long overdue.

Much has been accomplished even as the result of grafting the *ledgeriana* on to the less exacting *succirubra* in Java, a comparatively easier line of work which we are told is being done with great facility by ordinary coolies trained for the work, at the rate of some 300 to 500 grafts per day for a set of two coolies; it should be possible to undertake this work at least straightaway on the present Government plantations themselves. It is stated that this was attempted but was not persisted in. The point is further stressed that unless this better species and better yielding types among them are grown, it will not be possible to reduce the cost of production. This cost of production will probably be the rock on which schemes of expansion and continuance will split; motives of self-sufficiency are not likely to stand the strain of the ever present and insistent claims for economy, especially if large supplies of cheaper quinine should be available from Java or other foreign sources. The lines of expansion indicated in the report are cautious and sound: we hope suitable action will soon be taken to give effect to the recommendations. (*S. K. Y. in Current Science*, Vol. 8. No. 9 September 1939).

Gleanings.

Spraying and Photosynthesis. The application of a spray fluid for the control of insects or fungi has usually been regarded solely from the pathological point of view. R. A. Hyre has shown, however (Cornell Univ. Agr. Exp. Sta. Memoir 222, Ithaca, N. Y., April 1939), that certain sprays lower the photosynthesis of the plant to which they are applied. Lime-sulphur may even reduce it by as much as 28 per cent at ordinary summer temperatures, but Bordeaux mixture, on the other hand, has little effect. Emulsified sulphur pastes were found to be intermediate in their effect upon photosynthesis. Respiration was not markedly affected by spray fluids. Studies upon such factors as the biennial bearing of tree fruits show that these plants cannot sustain any considerable loss of photosynthesis with impunity. The loss in anabolism through spray applications is not of many days' duration but it is likely to occur at the critical time of flower bud formation, when the extent of the subsequent year's crop is being determined. The use of Bordeaux mixture instead of lime-sulphur in the summer spray programme would provide a practical means for the achievement of pathological control without physiological disturbance. (*Nature*, Vol. 144, No. 3644, Sept. 2, 1939, p. 447-448).