FERTILIZER RECOMMENDATIONS FOR TEA IN CEYLON—1969

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With the evidence obtained from a large number of fertilizer experiments carried out by the Tea Research Institute of Ceylon and also from observations made on estates it has become necessary to revise our fertilizer policy. This paper summarizes the existing recommendations and also incorporates new findings on several aspects of fertilizer use. The recommendations are based on recent experimental results.

Tea is grown in areas differing soil and climatic conditions and it is therefore necessary to vary the recommendations for the major tea-growing areas.

In general nitrogen applications have increased tea yields substantially, but the response to phosphate and potash has been limited. The practice of using standard fertilizer mixtures may, therefore, result in some waste of phosphate and potash, particularly at very high levels of nitrogen application.

NITROGEN

The following range of nitrogen levels is recommended :

	(lb N per acre per year)	
District	Seedling	Clonal
Up-country	80-200	240-360
Uva	80-200	240-360
Mid-country (Wet Zone)	80-160	240-360
Low-country	80-120	240-360

It is no longer recommended that the level of nitrogen should be decided strictly, on a replacement basis in relation to yield. A wide range of levels of nitrogen is suggested and the quantity to be added could be decided by considering the yield potential of the field. Some idea of the yield potential may be obtained from the average poundage of made tea per acre per year over the past one, two or three cycles and in this connection the suggestions given in an earlier publication on levels of nitrogen application for mature tea would prove useful (Suggested schemes for level of manuring of mature tea, *Tea Quarterly*, Sept. 1963).

As a guide for deciding on the level of nitrogen for seedling tea the following scheme is suggested.

Yield category (lb/acre/year)	Level of N (lb/acre/year)
Less than 800	80
800-1200	100-120
1200-1600	120-160
Over 1600	160-200

Seedling tea yielding over 2000 lb/acre/year may need special consideration ; a level of nitrogen above 200 lb/acre/year may be necessary.

In assessing the yield potential of fields, such factors as the density and spread of plants, jat, pests and diseases are important. The range of nitrogen indicated above is the average for the cycles. Before and after pruning, an application of nitrogen is omitted up-country.

For example, for a field of seedling tea up-country receiving 400 lb nitrogen per acre per cycle, the distribution of nitrogen may be as follows :

80 lb nitrogen during the 1st year after pruning in two applications, the first being applied at the time of plucking ;

120 lb nitrogen during the 2nd year in three applications ;

120 lb nitrogen during 3rd year in three applications ;

80 lb nitrogen during the 4th year in two applications, the last one being about four months before pruning.

Taking as a further example, a clonal tea field receiving 900 lb nitrogen per acre per cycle, the distribution of nitrogen may be as follows :

180 lb nitrogen during the 1st year after pruning in three applications, the first being applied at the time of plucking ;

240 lb nitrogen during the 2nd year in four applications ;

300 lb nitrogen during the 3rd year in five applications ;

180 lb nitrogen during the 4th year in three applications, the last one being about three months before pruning.

PHOSPHATE

For all districts, 20 lb P_2O_5 per acre per year for mature seedling tea and 30 lb P_2O_5 per acre per year for clonal tea in the second and subsequent cycles are considered adequate. The form of phosphate recommended remains the same, that is, saphos (rock) phosphate.

POTASH

The following levels of potash are recommended :

	(lb K_2O per acre per year)	
District	Seedling tea	Clonal tea
Up-country	60	90—120
Uva	60—90	120
Mid-country (Wet Zone)	60	90—120
Low-country	40	90

The levels of phosphate and potash recommended will remain the same for all years in the pruning cycle.

NPK BASAL MIXTURES

From the above recommendations it is clear that no standard NPK mixtures could be formulated which could be used under all conditions and throughout the cycle. A convenient method would be to have one basal NPK mixture for seedling tea and one for the clonal tea which could be supplemented with additional doses of nitrogen.

For instance, in seedling tea up-country, a basal mixture consisting of 80 lb N, 20 lb P_2O_5 and 60 lb K_2O could be applied in two doses in each year of the cycle. In the 2nd and 3rd year additional doses of 40 lb N may be applied. For clonal tea up-country, a basal mixture consisting of 180 lb N, 30 lb P_2O_5 and 90 lb K_2O could be applied in two doses in each year of the cycle. In the 2nd and 3rd years one and two additional doses of 60 lb N respectively should be applied.

In the low-country and mid-country wet zone a mixture of 80 lb N, 20 lb P_2O_5 and 40 or 60 lb K_2O may be given in two applications for seedling tea with additional applications, each of 40 lb N only, according to the level of nitrogen required. For clonal tea, a mixture of 200 lb N, 30 lb P_2O_5 and 90 lb K_2O may be applied in five applications, with additional applications, each of 40 lb N only in the second or third year of the cycle. The response to nitrogen is lower in the first year of the cycle, and less nitrogen should accordingly be applied.

MAGNESIUM

As a routine application for seedling tea, and for clonal tea in the second and subsequent cycles, one cwt dolomite per acre per year is recommended. This could be applied either every year or once a cycle after pruning. In general, the above rate of dolomite application, should satisfy the magnesium requirements of tea. But where magnesium deficiency symptoms (Mulder and de Silva 1959) are prevalent, kieserite (24% MgO) may be incorporated in the fertilizer mixture (but not with urea) at the rate of 100 lb per acre per year in addition to routine dolomite application. Alternatively epsom salt (17% MgO) may be sprayed at the rate of 50 lb per acre per year in four doses. This could be sprayed as 12.5 lb epsom salt in ten gallons of water per acre, per application. It may also be convenient to combine epsom salt spraying with routine zinc sprays where a mixture of five pounds zinc sulphate and 12.5 lb epsom salt is dissolved in ten gallons of water.

ZINC

Zinc deficiency has been reported to be of wide occurrence (Tolhurst 1962), and routine applications of zinc as a foliar spray have, therefore, been recommended (Tolhurst, Fernando and Tillekeratne 1966). Yield responses to foliar sprays of zinc sulphate have been promising and the present recommendations for zinc remain the same as given previously (Tolhurst *et al.* 1966), *ie* 20 lb zinc sulphate per acre per year given in four applications of five pounds each. The normal practice of applying five pounds in ten gallons of water using a mistblower would be adequate.

Zinc oxide (80% zinc) at 6 lb per acre per year may also be used instead of zinc sulphate. In this case, one and a half pounds zinc oxide in ten gallons water should be mist-blown at each application. Zinc oxide being insoluble in water, care should be taken that it does not settle in the tank.

BORON

There is no definite experimental evidence to support routine applications of boron. The appearance of symptoms resembling boron deficiency particularly in *Grevillea robusta* in certain areas has led to the suggestion of applying four pounds borate per acre per year to the soil. This could be incorporated in the NPK mixture.

ECONOMIZING ON FERTILIZERS

When the necessity arises, as in the recent tea crisis, to save on the cost of fertilizer applications we recommend the following steps. For both seedling and clonal tea, phosphate applications may be omitted for one or two years provided this has not been done in the past five years (see Tolhurst 1965). For seedling tea a minimum of 80 lb nitrogen and 40 lb potash should be given for every full plucking year. In the case of clonal tea a minimum of 240 lb nitrogen and 60 lb potash should be given for every full plucking year.

FERTILIZER FOR YOUNG TEA

For the first two years after planting the fertilizer recommendations previously suggested (Tolhurst 1961) remain unchanged. For convenience, the levels of T 200 to be applied for the first two years are tabulated below.

Amount of T 200 per plant per application	No. of applications	Nutrient content based on 5000 plants per acre per year			
		N	P_2O_5	K_2O	MgO
First year $\frac{1}{2}$ oz	6*	90	64	70	28
Second year $\frac{3}{4}$ oz	6*	135	96	105	42

* where weather conditions do not permit 6 applications, 4 applications of $\frac{3}{4}$ oz and 1 1/8 oz for the 1st and 2nd year respectively are suggested.

From the beginning of the third year after planting until the first prune T 200 is not adequate and the following levels on N, P, K and Mg are recommended.

Nutrient level (lb per acre per year)

N	P_2O_5	K_2O	MgO*
200-240	55	120	24

* MgO to be given as keiserite

UREA

Provisional suggestions on the use of urea as a source of nitrogen for tea were given by Chenery (1967). Both field and laboratory experiments investigating different aspects of this problem are being pursued and the results will be published when they are available. In the meantime, the following tentative recommendations are given.

a) *Type of urea*

Only prilled urea of low biuret content and with good keeping qualities should be used.

b) *Type of tea*

For young tea in the 1st and 2nd years, we do not recommend the use of urea. For seedling tea and for clonal tea from its 3rd year urea may be used.

c) *Extent of acreage under urea*

It is suggested that the use of urea be stepped up to about 25% of the estate acreage ; in other words at least one-fourth of the nitrogen requirements of an estate should be supplied with urea.

Although there is no objection to the use of sulphate of ammonia and urea on the same fields, we suggest that at least one field be kept entirely on urea so that its performance can be compared with that of sulphate of ammonia fields.

d) *Dose*

The dose suggested is 40-75 lb nitrogen per acre per application.

e) *Time of application*

In order to obtain full benefits from any fertilizer it is necessary to apply it at the correct time. With urea, this factor is very important. The ideal time for the application of urea is during periods of moderately wet weather.

f) *Method of application*

Under ideal weather conditions, urea can be broadcast with satisfactory results. No other method is recommended at present. Different methods of application of urea are under investigation in experiments, particularly during less favourable weather conditions. At present, we see an advantage in deep forking the first application of urea after pruning, when such an operation can be conveniently carried out, and if funds are available.

g) *Distribution*

Until the labourers get used to handling the small bulk available when urea is used, close supervision of the application is advised. The following suggestion may be observed :

> The labourers may be given a measure, and told how many measures to apply for a given number of bushes in a particular field. A chundu (condensed milk tin) of prilled urea is approximately half a pound.

h) *Mixtures*

In laboratory scale mixing of prilled urea with other fertilizer components the following observations were made :

(i) Prilled urea and saphos phosphate (a finely powdered product) did not give a uniform mixture. A mixture of these will tend to separate into the components during transport.

(ii) Prilled urea, saphos phosphate and muriate of potash gave a uniform mixture. This may be due to the slight dampness caused by the muriate of potash which results in the formation of a coat of saphos phosphate around each urea pellet. This mixture when sealed in a polythene bag kept very well even after five months. Further, there was no measurable loss of ammonia from this mixture, whereas a similar mixture with sulphate of ammonia lost about 3% N in one month.

i) *Foliar spraying*

At present foliar spraying of urea is recommended only for treatment of nitrogen deficiency. We do not, however, discourage those who want to experiment with foliar application of urea with the objective of obtaining increased yields. The following information should be useful :

(i) At St Coombs, a 3% solution of (three pounds urea per ten gallons water) urea did not cause any scorch when sprayed with a knapsack sprayer at the rate of about 100 millilitres per bush. This is approximately 110 gallons per acre of 5000 bushes.

(ii) Higher concentrations, say five pounds urea per ten gallons water, may be sprayed using mistblowers, but the effectiveness of mistblowing in respect of the assimilation of urea is questionable.

(iii) The time taken for absorption of urea is expected to be two to 48 hours. This means that heavy rain during this period, after the spraying of urea, will reduce the quantity assimilated by the bush.

(iv) It has been reported (D. N. B. *et al.* 1967) that absorption of urea is greater when applied on the underside of the leaf.

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