

# MANURING YOUNG TEA: PLACEMENT AND NEW TYPES OF FERTILIZER

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Experience has shown that young tea is capable of very rapid development, and judging by the stream of reports which come in to the Institute it seems that we do not yet know the full potential of either clonal or seedling new plantings. Whatever we may think about the level of cropping which is sometimes imposed upon very young plants—a problem which is attracting more and more attention—there is no doubt that intensification of manuring has become popular, particularly in the earliest stages of a new planting. It is this aspect which the Agricultural Chemistry Division has singled out for detailed investigation, because there are a number of possibilities for combining new types of fertiliser and methods of placement at the time of planting. There seem also to be practical reasons for paying special attention to manure application within the first few months from planting. Publication of this note will coincide roughly with the start of a series of short-term trials, and is intended to stimulate general interest in experimental methods of manuring. The trials themselves could be interpreted more usefully if we had sufficient information from estate experiments on the practicability of the ideas set out here.

## 1. Types of fertiliser

Cost is not such an important factor in this connection and we have a greater choice of fertilisers than we have when manuring mature tea. The properties of the different types vary widely and this should be appreciated if they are to be used efficiently, or even safely.

### 1.1. *Soluble Inorganic*

Three of the components of the Young Tea Manure Mixture, T.200, are in this category.—sulphate of ammonia, magnesium sulphate (either kieserite or epsom salts) and muriate of potash. All, but particularly the last, can damage plants if they come into direct contact with leaves, soft bark, or roots. So can superphosphate, urea, ammonium phosphate, sulphate of potash and any of the compound granular manures which have recently appeared in Ceylon. (Note: it is not strictly correct to refer to urea as “inorganic” but for practical purposes urea fertiliser should be included here.)

Sufficient dilution with soil or water before or at the time of application readily lessens the risk of plant damage.

### 1.2. *Insoluble Inorganic*

The commonest example in this group is the fourth component of T.200, rockphosphate, which dissolves slowly in the soil and cannot scorch plants by direct contact.

Nor should urea—formaldehyde (u-form) or potassium metaphosphate under practical conditions. The latter fertiliser requires introduction and comment in another section, but u-form is already well known on several estates. Although

urea is used in its manufacture, u-form bears no resemblance to urea. It is, in fact, powdered waste from the manufacture of plastic buttons, combs *etc.* It decomposes readily in soil to release ammonium—nitrogen. Laboratory tests have shown an appreciable release after incubation with moist soil at normal temperatures for three weeks. It is probable that some of the nitrogen is released only after a period of several months. U-form contains 18% nitrogen (N) and no other plant food. Occasionally, references can be seen to compounds with a similar name but containing up to 38% N. These compounds have been found, in other countries, to release their nitrogen less efficiently than is considered desirable.

The fourth fertiliser in this category, dolomite, will also be considered in another section.

### 1.3. *Organic*

While both urea and u-form should be described as “organic”, it seems preferable to exclude them from the company of animal or vegetable products, raw or mildly processed. Composts, tea fluff, dung, “green manures” and residues from rehabilitation crops will also be excluded. Residues from rehabilitation crops are considered to be important as sources of plant food at the time of planting, and are taken into account in our present detailed trials. Composts, *etc.*, need special consideration and will not be dealt with in this note, except to remind planters that such bulky materials can sometimes be dangerous either in the planting hole or on the soil surface. (Tolhurst, 1958).

More concentrated organic fertilisers are available in variety, from seaweed pulp to oil-seed residues and animal remains. Most contain nitrogen and few contain many other plant nutrients. It is important to find out just what nutrients, and in what concentration, each particular product does contain when estimating dosage. The solid products are not likely to damage plants by direct contact and, with the exception of seaweed pulp and some oil-seed residues (*e.g.* castor cake) are dry and powdery, are easy to distribute and are readily mixed with many inorganic fertilisers.

The rate of decomposition varies greatly. Blood meal breaks down very rapidly, while leather meal may take months to release most of its nitrogen. Animal and bone meals and hoof-and-horn meal occupy an intermediate position, the rate depending largely on the fineness of grinding.

Potash and magnesium contents are usually negligible, and it is necessary to warn planters that products sold in Ceylon as “balanced animal meal” contain added muriate of potash. Often, when used for young tea, magnesium sulphate is added as well. Plant scorch has often resulted from careless use of these products, perhaps due to the fact that they retain the appearance of a “safe” organic manure.

Trace element content is sometimes offered, all too often in vague terms, as a desirable quality of organic fertilisers. Also, suggestions that a direct effect may result from, unspecified, organic compounds formed during decomposition are occasionally forthcoming. Even if either claim were to be substantiated, it is doubtful that it would be of significance in the practice of young-tea manuring.

### 1.4. *Alkaline*

This term is used rather loosely in tea-growing parlance and it may seem strange that we should give consideration to this category of fertiliser. Several fertilisers decompose to give products of a pH higher than a safe limit for tea. When diluted with soil, the effect of this reaction may be buffered to such an extent that the

soil pH itself is little changed. The buffering capacities of soils vary, and usually a high organic matter content improves the buffering properties. This question is important because otherwise-valuable fertilisers fall into this category.

Potassium metaphosphate, in a fertiliser grade, is a very new product. It is concentrated, dry, and can be formulated as stable granules. It decomposes slowly in soil, at a rate depending on the granule size.

Dolomite is the only slowly soluble magnesium fertiliser available to us.

Bone meal, containing nitrogen and phosphorus, may tend to be used in fair quantity as its nitrogen content is so low. The rate of decomposition is much greater than for dolomite, for example, and it would seem in general that bone meal might be a risky manure to use in planting holes, due to a temporary rise in pH values.

Our trials are paying particular attention to the possibility of using potassium metaphosphate and dolomite with the minimum of risk. At present, we could not advocate the use of either fertiliser in practice.

## **2. Methods of Placement of Manure**

Basket and sleeve plants can carry small quantities of nutrients into the field if the nursery is well manured shortly before planting out. This method of placement will not be dealt with further in this note. Nor shall we add to the complexity by discussing foliar spraying of nutrient solutions.

### *2.1. Residues from rehabilitation crops*

We have always considered it to be an important function of rehabilitation crops that their roots, and to a lesser extent their top growth, can be used to place nutrient-rich organic matter in the soil profile and in the planting hole (Tolhurst, 1956). Top-growth residues, if they are to be incorporated into the planting hole, should preferably be dead before doing so.

We have also stressed that this value may be nil, or may even become negative, if the crop is not manured generously. If crops other than deep-rooting grasses should come into use their significance in terms of nutrient placement may well be slight.

### *2.2. Surface Placement*

In earlier writings (Tolhurst, 1959, 1961) warnings were given regarding risks of damage to very young plants if too large doses of soluble inorganic manures were applied, or if application were done carelessly. At the present time there is a growing tendency to use "organic mixtures" for the first few applications, at least. Even so, if a manure balanced in potash and magnesium is used, a risk of scorching will remain. It seems to be difficult to get labourers to dibble in manure properly. Weed scrapers, or similar hooked strips of metal, are all too popular. These, as can be seen in practice, often remove soil on the lower side of the planting hole or even hook roots and draw them up into the manure-rich surface layers. In either case manure and roots, sooner or later, are likely to come into direct contact.

If larger doses of soluble inorganic manures are to come into general use the operation of dibbling will have to be done carefully. If it is feared, or found by

experiment, that this is still insufficient protection against root damage in the earliest stages of growth the answer will lie in a choice between more frequent application of smaller doses, or placement in the planting hole.

Insoluble inorganic fertilisers and also true organic fertilisers would certainly reduce the above risk to a minimum. Both would still require to be dibbled-in; the inorganic manures to dilute potentially alkaline fertilisers (see 1.4 above) if a balanced manure were used, and the organic fertilisers to prevent the loss by volatilisation of ammonia (containing the decomposition product of the nitrogen component). Note that no completely organic manure at present likely to be used conforms to our definition of a balanced young-tea manure.

### 2.3. *Placement in the planting hole*

This method, which has already become popular with some superintendents seems to offer the best way of overcoming the worst dangers which are certain to be aggravated if manuring rates continue to increase.

The points which have to be settled by experiment concern (a) the degree of mixing with soil at the bottom of the hole which is required to render soluble or alkaline fertilisers safe (b) the size of dose and type of fertiliser capable of supplying the plant's needs over a long interval. This is in order to obviate the necessity for surface manuring for as long as possible during the critical period when the plant is establishing itself under field conditions.

The more soluble or alkaline fertilisers which are included in the mixture and the larger the dose, the greater the necessity for thorough mixing with a larger volume of soil. This is not always a popular practice, for various reasons, and our experiments and suggestions in the following section take into account the fact that some hole-placement will be done with little or no such mixing, or that the mixing will be done carelessly.

It may be necessary to point out that if holes are left open for a week or two before planting up, as does happen on occasion, and if soluble fertilisers or readily decomposable organic products (*e.g.* blood meal and some components of animal meal) are placed in the hole soon after cutting, then there is a risk of nutrients being washed too deeply into the soil profile. Thorough mixing with the soil would naturally aggravate this.

The practice of mixing manure with the spill from each hole seems to have little in its favour as compared with placing the manure at the bottom of the hole. It is likely that much of the spill will remain at or near the surface especially if the holes are small. Polythene-sleeve plants often go into the field with large roots running down the outside of the soil core, and these may be readily damaged if manure-rich soil were to be packed round them. Scorching of such roots near their point of origin would, obviously, be a severe check to the plant.

## 3. **Suggested Experiments**

It is possible that some superintendents would wish to compare different fertilisers or methods of placement, and we offer the following simple schemes. It is most important to note that we assume that two or more treatments will be compared at the same time, keeping all other operations similar. The more repetition which can be managed, either within a block of one clone or spread over blocks of different clones, the greater will be the value of the experiment. The Institute would be prepared to discuss more comprehensive experiments if desired.

In the first instance we suggest comparison between three forms of nitrogenous fertilisers; sulphate of ammonia (20.6% N); urea-formaldehyde (18% N) and hoof and horn meal (usually 13% N).

#### Group 1

Surface placement, comparing—

1. T.200
2. T.200 based on urea-formaldehyde as the form of nitrogen.
3. T.200 based on hoof-and-horn meal as the form of nitrogen.

The manure suppliers would no doubt supply information regarding the relative levels of use. Other organic compounds could be substituted in the third mixture. Dosage and frequency could be selected from the table given in the *Tea Quarterly* (Tolhurst, 1961) and the comparison could be continued from the time of planting until the first prune.

#### Group 2

Placement in the planting hole—

Here, nitrogenous manures alone might be compared; for example—

- 1 ounce sulphate of ammonia per hole
- 1 ounce urea formaldehyde per hole
- 1½ ounce hoof-and-horn meal per hole.

These levels supply, approximately, the same amount of nitrogen. Each should be mixed with at least 4 inches of soil at the bottom of the hole, planting to be done as soon as possible. The experiment could be extended to include two levels of some or all of the above fertilisers.

If it were not desired to mix the manure into the soil, we strongly suggest omitting sulphate of ammonia from the comparison.

The aim of this trial would be to assess the period of effectiveness of each treatment and no other nitrogenous manure should be given for, say, six to nine months. A mixture of P, K, Mg (derived from T.200 less the sulphate of ammonia) could well be applied, on the surface.

Assessment in estate trials is not always an easy matter, and usually relies mainly on observation of plant size, colour, *etc.* Clones such as TRI.2023, 2024, 2025 and 2026 are good indicators of a lack of nitrogen and this, rather negative, feature might be of value in assessing the results of the Group 2 trials, particularly if two levels of fertiliser are compared.

In conclusion, we repeat our offer to assist with such trials and would welcome the chance to do so.

#### References

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