

strains, if half of the entire area under cumbu in the nine districts is brought under the hybrid strains. Six more hybrids have passed the experimental stage and await trials in the districts. When the trials are completed, these too will be available for spread according to the special needs of the different tracts in this State.

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Pretreatment - A New Aid for Improving Crop Yields

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It is the object of this paper to just outline a few of the results obtained in the direction of improving yields by a new method—that of supplying nutrient elements to plants before they are sown.

It is course a truism to say that good crops are assured by good manuring, in the same way as good food makes for sturdy men and women. What is not so widely known is the fact that for plants too, a little help in the early stages, goes a long way in improving the subsequent growth and their ultimate yields in the same manner as a liberal supply of milk and milk products to children helps in laying the foundation for a strong and healthy manhood. The basic principle underlying the idea of pretreating seeds with nutrient salts is to introduce into the seed enough of the major nutrients like phosphorus and potassium in a readily available form, sufficient to carry the young plant through its early stages, before its root system is sufficiently developed to make full use of the available supplies of these nutrients in the soil.

In the present day context of all-round scarcity, for everything from a match box to a motor car, it is imperative to use what we do have, to the best advantage and make a little go a long way. The question of supplying fertilizers to crops is no exception to this rule

and in recent years, attention is being directed towards a more efficient use of fertilizers. by means of split doses, fertilizer placement, at optimum depths, by seed coating etc. Among the various methods that have been tried with the object of making available a larger quantity of nutrient elements to growing plants the one suggested by the English workers, Roach and Roberts in 1948 deserves a special mention. These workers investigated the possibilities of this method, both as a means of supplying major plant food elements like phosphorus and potassium and as a means of correcting trace element deficiencies. They found in the case of oats, that by soaking the seed in about one-third of its weight of a solution of tri-basic potassium phosphate and sowing the treated seed in a phosphate deficient soil, the yield could be improved from 17 bushels (820 lb.) of grain to 25 bushels (1,050 lb.) per acre, an increase of nearly 47 per cent. The straw yields too, showed a corresponding increase. Similar large increases in yield were also observed in the case of other cereals, like wheat and barley, although the optimum concentrations of the soaking liquid were different for these grains. The phosphate imbibed by the seeds was deposited mainly on the husk, and was liable to get easily washed off in running water.

This method as would be realised, has a number of very marked advantages, if only it could be substantiated on large-scale field trials for our major food crops. It is an easy and convenient method, it is simple and does not call for any elaborate equipment, it is comparatively cheap and can be adapted for a variety of crops and various types of nutrient solutions and as such the method can be regarded as having very great potential practical importance as an agronomic method.

Preliminary studies were accordingly initiated at Coimbatore. to see how far the growth and yields of some of our Indian crops could be improved by the use of this presoaking technique. The general method was to soak a known weight of seed in one-third of its weight of a solution of the appropriate salt, the quantity of the solution being such as to get all absorbed by the seed in the course of 24 hours. The soaked seed was then air-dried by spreading it thin in a wide tray, with occasional turnings to ensure uniform drying. A variety of nutrient salts were tried in various concentrations on paddy, ragi, groundnut, bengalgram, blackgram and cowpea. Except in two cases where field trials were carried out, the results below are those obtained from pot culture studies.

In the case of paddy, it was found that by presoaking the seed in a 20 per cent solution of tri-basic potassium phosphate the grain yield was improved by as much as 39 per cent in pot cultures and 13 per cent in field trials. When a lower concentration of 10 per cent of the same salt was used, the increase in grain was 21 per cent in pots and 10 per cent in the field. With ragi soaked

in 20 per cent tribasic potassium phosphate, there was an increase in yield of nearly 60 per cent in grain and 40 per cent in straw. In the case of pulse crops the most useful solutions, as well as their optimum strengths were found to be quite different from those found best for paddy and ragi. For instance, in groundnut the yield was improved best, only by mono-potassium phosphate, used at a concentration not exceeding 2 to 5 per cent. Higher strengths inhibit seed germination. This is in line with the observation made on wheat by Roach and Roberts, where the growth was adversely affected by concentrations of more than 5 per cent, of the soaking liquid whereas barley and oats could tolerate up to 30 per cent. For bengalgram and cowpea a 20 per cent solution of calcium phosphate was found to be the best and gave the highest increase in yields in the preliminary trials. It must also be mentioned that for blackgram, none of the solutions that were beneficial to other crops, were found to be helpful, in increasing either growth or the yield of pods.

In the case of cotton, some striking results have been reported from Indore, as a result of presoaking seeds in nutrient salt solutions. For this crop ammonium sulphate and mono-potassium phosphate were found the best two salts among all those tried and these gave an increase in kapas yield of 157.9% and 126% respectively, as compared to the controls.

It would be clear from these results that there are undoubted possibilities in this new technique of presoaking seeds before sowing them and giving them a better start in the early stages of growth. It is also clear from the studies carried out so far, that for each crop there seems to be a particular concentration of a specific salt, which is the most helpful in improving growth.

As a variant of this technique, we may cite the use of growth promoting chemicals. These growth-promoting chemicals or growth hormones as they are termed, have been found to have very far-reaching and varied effects on plant growth and development, even in very minute doses, more or less on the same lines as vitamins have in human and animal nutrition. A preliminary trial conducted at the Nanjanad Research Station on potatoes, indicated that the yields could be improved by nearly 33 per cent. by soaking the tubers before sowing, in suitable dilutions of these growth-promoting chemicals, such as indole-acetic acid and indole-butyric acid.

Yet another variant of this pre-treatment technique may also be cited on this occasion and that is the process called vernalisation. This process consists in essence, in subjecting soaked seeds or young seedlings to certain modifications of light, moisture and temperature. It was first described by the Russian biologist Lysenko and the term vernalisation itself is one that was coined by the Russians, when they attempted to convert their long duration winter wheats into spring

wheats of a shorter duration. The potentialities of this method too, in regard to shortening the duration of rice under South Indian conditions, without diminution of yield, have been studied at Coimbatore for about three years. A fairly extensive series of experiments have been carried out in the field as well as in pot cultures and it was found that there was a distinct positive response in the yield of certain varieties of paddy, when subjected to vernalisation. The increase in yield was found to range from 14 to 38 per cent in the case of grain and from 7 to 34 per cent in straw.

The few examples that are given above would serve to show, that the method of pre-treatment is one that holds out a distinct promise of becoming one of the most helpful methods towards maximisation of crop production and as such deserves to be explored to the fullest extent that is possible by us.

Pre - Sowing Treatment for Seeds of some Cultivated Plants

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Seeds of many cultivated plants do not germinate easily. Dormancy and impermeability of seed coat act as the main barriers in their germination. There are several methods of seed treatment for improving seed germination. But due to the complex nature of these treatments the agriculturist is unable to exploit them under our conditions, but is compelled to adopt a heavy seed rate to make up for the low seed germination. This entails a heavy loss of seed and cumulatively the waste of seed runs to several lakhs of rupees.

Trials at the Agricultural College, Bapatla with various methods of seed treatment, have shown that heat through water is the simplest agency for overcoming impermeability of seed, coats and secure increased germination. The response given by some cultivated plants, the method of treatment needed for each and the resultant advantages are briefly given below.

Wild Indigo (*Tephrosia purpurea*) *Vempali* — Telugu; *Kolungi* — Tamil.— This is a green manure crop grown extensively in South India and the annual consumption of seed is estimated at 5,000 tons. Pre-treatment by steeping in water at 90° C for five minutes induces over 60 per cent germination in a week's time, as against 15 to 30 per cent secured with the seeds normally in a month's time. The pre-sowing treatment is simple, economical and is far better than the existing method of pounding the seeds with sand.