DISCUSSION

Dr. Johnston :

I would first like to ask Mr. de la Pena whether the returns were economic to some of those extremely high levels of fertilisation which he reported ?

Mr. de la Pena :

We have not gone into the economics of this particular experiment since we were more interested in finding out what were the effects of fertilisation on the composition of the crop, and at present we are carrying on some experiments on the balance of these nutrients in the crop.

Mr. Sandys :

I would like to ask Dr. Samuels a practical question about cassava. I was in Africa for some years where cassava was always regarded as being a very exhaustive crop. On the other hand it was a crop which would grow in soils which would produce practically nothing else. I wonder whether, in fact, it has been shown that cassava is really a very exhaustive crop or whether the legend has grown up, because it is usually shown or seems to be growing in very exhausted soils.

Dr. Samuels :

I also have seen the literature abundant with the fact that cassava is an exhaustive crop, but if one makes analyses of the composition of the roots, and other parts of the plant, we find that it takes out quite a bit of nutrients, but not more so than many other crops. I think that it could not be considered as an exhaustive crop.

Dr. Spence :

I would like to ask Dr. Samuels about the characteristics of the sweet potato varieties. Were they high foliage varieties ? I note you got depression in yields with high nitrogen application. Was the variety used as a high foliage variety ?

Dr. Samuels :

I am going to pass this question to a colleague of mine, Mr. Moscoso, who is a sweet potato breeder. He might happen to know if this particular variety which we used which was the UPR 3 at that time, is considered a higher foliage variety in relation to the varieties growing here. Mr. Moscoso, UPR 3 in Cobre are they considered high foliage varieties ?

Mr. Moscoso :

These would be considered high foliage varieties in relation to the varieties you have here in Trinidad.

Dr. Sidrak :

I just want to make an observation on the tables which were presented by Mr. de la Pena. The graphs which he showed us reflect a very interesting feature.

For example, with the application of four different nitrogen levels to the soil, the leaf blades and petioles reflected these differences at three months, but failed to do so at nine months.

In the case of phosphorus, especially in the upland experiments, the leaf phosphorus was parallel to that applied to the soil at three and twelve months, but very little differences were shown at six months. With potassium applications the highest differential between soil treatments and leaf blades and petioles occurred at six months.

I want to emphasise here, that for physiologists who try to determine the mineral status of plants by analyses of leaves and petioles, they have to be careful about the

time, and the organ to be analysed at the particular time, in order to get a reflection of the available amount of the mineral element which might be considered to be present in the soil.

The problem of determining the availability of an element by inference from tissue analyses is not an easy one. We have to be careful, and to work out a definite programme for every crop, if we want to secure reliable results.

Mr. de la Pena :

I just want to thank Dr. Sidrak for his very valuable comments, and that is what we are following up from this experiment, because as far as we know we did not have any original information as to the response of this crop to fertilization, especially with the effects of fertilisation on composition.

In the University, we are running cultural studies in which we are trying to analyse the total plant with the leaves, the petioles, and the nodes that form separately at different stages, so that we can more or less paint a broad picture of the crop itself.

Dr. Samuels :

I want to add a little point to a very valuable suggestion that was made, and that does not only consider the nutrient mineral content and the age and the part of the plant to be sampled, but also the moisture content of what you are sampling.

Our work on sugar cane has shown that the moisture status of the plant has an important bearing on the interpretation of the levels of tissue nutrients. If you use one of the plant organs as a quantitative calibration of the moisture content of the plant you may be able to detect differences by relating this to plant fresh weight. This is particularly true in the case of potassium.

Dr. de Gras :

What I was thinking of the remark of Dr. Sidrak is that when you compare the response of **Colocasia** and grass you don't compare the same thing, because the length of the duration of one leaf in Colocasia is very much greater than the length of one leaf of grass. When you compare the response for the grass you are comparing something which is very different.

Dr. Wilson :

I would like to ask Mr. de la Pena whether he had any rainfall figures for the upland and lowland conditions.

Mr. de la Pena :

Yes, we had rainfall figures for the upland, but we did not bother to record the lowland, because it had been almost under irrigation throughout the year, and it would be interesting to add that the rainfall in the particular phase which we used, was heaviest about the time of planting, and at the age of 12 to 15 months the rainfall came back again, and just about 6 to 9 months the rainfall was lowest, so that was probably one of the reasons why we had a very low yield in the uplands. The water supply was lowest when the crop probably needed it most.

Mr. Morgan :

I would like to ask Mr. de la Pena about the method of expressing the nitrogen and phosphorus content in these plants. We use percentage in the leaf and I wonder whether this is an adequate method, when you consider, that a small leaf from a whole fertilised or stunted plant might exhibit a high percentage of a nutrient that a larger leaf, which is doing very much better and growing much better from a well fertilised plant.

Mr. de la Pena :

Well, that is very true indeed. We have noticed this too in other experiments that we have run, but since in our particular experiment the nutrients were not very

deficient, then we had this increase in nitrogen or phosphorus and potassium content of the leaf. But we also observed that when the crop is growing in a very poor soil, then it just grows to a certain point, and stops at that size, so it maintains just about the normal concentration of the nutrient. This is one of the things that we have to look at when using percentage basis for formulating fertilizer programmes.

That is one reason why some investigators suggest taking the total nutrient content in the plant instead of just th percentage.

Dr. Samuels :

Again I would like to answer this from the physiological standpoint. We who have been studying foliar diagnostic techniques with many crops including sugar cane and pineapples, are aware that a small plant may show an accumulation because of many factors and therefore actully have a high nutrient content. We overcome this by using what we call a vegetative index. In sugar cane we usually obtain the growth or vegetative index by weighing the sheath of the plant each time we sample, so we get a progressive picture of what's going on. In pineapple we do the same thing by weighing leaves. I think that it would be a good suggestion for those of us who are going to start working in root crops to also consider this idea. But, you must remember that the weight must be considered for the actual plant you are working with at that time. You cannot compare weight of leaves, etc. from one variety with another or in one circumstance or another. It is a progressive picture of what is going on in that plant in that particular experimental field.

Dr. de Gras :

I would like to ask Mr. de la Pena if he thinks it would not be very interesting to have a shorter interval between the observation of the growth of the plant.

Mr. de la Pena .

Thank you for this suggestion. As a matter of fact, we have started this on sand culture. We were trying to take plant samples for analysis every week, and we are trying to find the breaking point, because we are also working with deficiency symptoms and we are trying to find the concentration ofnitrogen, for example, in the leaf or in the whole plant when the symptoms just start to show. So we are also doing something on this.