

## DISCUSSIONS

*Mr. J. Shrum:*

I would like to ask Mr. Haynes the details of the method used to induce sprouting with 2-chloro-ethanol and about the effect this had on survival of plant and on uniformity of sprouting ?

*Mr. P. Haynes:*

The planting piece is immersed into a solution of 2-chloro-ethanol in water. The concentration varies with the maturity of the yam. Since sprouting in yams is related to level of glutathione and so sprouting can be induced by weaker concentrations in older yams. After dipping in the solution the tubers are placed in a closed container for 24 hours. They are then placed in a sprouting bed, and kept moist and allowed to germinate. The normal polarity in germination of yam pieces where the head ends germinate before the tail pieces remains unaffected by 2-chloro-ethanol.

*Mr. L. Edwards:*

Commented on the affect of nitrogen applications to staked yams. He claimed that in experiments in Nevis in areas of high rainfall applications of nitrogen produced yields of up to 11 tons/acre on staked plots compared with yields of less than 9 tons on unstaked plots. The effect was reversed in low rainfall areas.

*Mr. D. B. Williams:*

On the question of the relative efficiencies of sweet and 'Irish' potato I would like to dispose of a possible aspersion cast on the quality of the sweet potato cultivars bred at St. Augustine. The U.S.D.A. miscellaneous Publication No. 572 reported that the Sweet Potato possesses  $1\frac{1}{2}$  times more carbohydrates than the 'Irish' potato. This advantage was maintained when calorific value was the index employed in this assessment.

Since this comparison involved the high carotene sweet potato and not a starch variety which is more like those bred locally, then I think that the suggestion of greater efficiency for the Irish potato would seem to me to be untenable.

*Mr. P. Haynes:*

I will agree with Mr. Williams that weight for weight the sweet potato is superior in carbohydrate content to the 'Irish' potato. However we must compare like things. My comparison was based on production per acre per year. The sweet potato occupies the land for a longer time than the 'Irish' potato when grown in the tropics. On a theoretical basis there would be a greater production from the 'Irish' potato per unit time. The contention I hold will still stand.

*Professor F. L. Milthorpe:*

Mr. Chairman if Mr. Haynes and his colleagues would forgive me saying so, I think that this work does show excellently the way we must follow. It is an example which many of us must follow in order to understand the way in which tropical crops are behaving, and how they increase yield. Also it does illustrate a point which we tried to make elsewhere (in the study group) and that is that the yield of many of the crops is likely to be increased, if one selects for a much higher ratio of tubers to leaf area and then puts on a lot of nitrogen. I think this is exactly what Mr. Haynes has shown in the comparison of the two varieties of sweet potato.

I understand that this is the basis of increases in yield in cereals for the last 20-25 years. Mr. Haynes' work seems to suggest that the same type of phenomenon operates with the tuber crops as with the grain crops.

*Dr. L. A. Wilson:*

Mr. Haynes mentioned a decrease in concentration of glutathione. Is there a suggestion that ethylene-chlorohydrin (2-chloro-ethanol) helps to decrease this concentration and therefore inhibits sprouting ?

*Mr. P. Haynes:*

2-chloro-ethanol causes an increase in concentration of glutathione and this allows germination to take place.

*Dr. G. Samuels:*

You mentioned 11/pl and that you considered this a negative factor in yielding ability. You cannot use the same ranking order as for the other factors which were positive.

*Dr. L. Degras:*

Yes, I have used an inverse order.

*Mr. E. G. Gooding:*

In table 1, a set of figures are put down for the dry matter yield in kilograms per hectare per day for yams and sweet potatoes. Now this, I think, is related to the full crop duration. I just want to make the comment, in passing, that if you consider the period of bulking of the yam tuber, this takes place in roughly ten or eleven weeks, in other words, 70-80 days, the rate of bulking is extremely high. We found this in observations in commercial fields. This works out to something like 80 kilograms per hectare per day, which is about twice as high as the figures given here.

*Dr. W. O. Jones:*

I am very diffident about asking this question of Mr. Haynes, but this is supposed to be an inter disciplinary as well as cross cultural international conference, so I would like to ask your indulgence for a minute. I have tried to understand that chart on the board, about the C9 and O49 sweet potatoes. It seems to say — and this is all it says to me — that if you want to put 120 lbs of nitrogen ~~on~~ per acre you may do so, and it will not reduce your yields, or what you get without the nitrogen, if you just wait a little longer for it.

Now, does it say any more than that ? And if that is what it says, is not the conclusion 'let's not put the nitrogen on unless we are producing nitrogen at a negative cost'. Or have I got it all mixed up ?

*Mr. P. Haynes:*

Yes, I agree. Your assessment is quite correct. But we are using this to explore variety response, and we want to find out a principle here. There is the possibility that there are other varieties, which will give this response earlier, and these are what we must look for. We should not think only in terms of response to nitrogen because this response is complex and varies between varieties.

The charts show something of that varietal difference. This work is explorative and is designed to gain a better understanding of the nature of response rather than to formulate fertilizer practice. The particular varieties were chosen because of their contrast in leaf habit.

*Dr. G. Smith:*

I feel even more diffident about speaking to a gathering of plant physiologists and all the other "ologists" because I am a physicist, but it always strikes me, as being of the utmost importance, in experiments such as we have heard about this morning, to know, not only what varieties you have got, what fertilizer you have got, whether you stake or you don't stake. What has happened to the weather ? Are weather

factors always directly comparable in your experiment ? How do these vary ? Once we can mention the question of quite different answers in low and high rainfall areas in, I think it was Nevis. What has happened in your various experiments with the soil moisture ? Are they always comparable ? Will you get the same answer next year when it is very dry or very wet ?

*Mr. P. Haynes:*

Thank you very much Dr. Smith. I am glad that you raised this point. We are aware of these differences, and in fact, our trials are conducted in the dry season and in the wet season and we get different responses. One finds, a very much lower leaf area development in the dry season and an earlier production of tubers. We are also examining the growth period, in terms of radiant energy, and for this, we are going to depend very heavily on you to supply us with some data, we will be taxing you in a very short time, so I am very glad that you are showing this interest.

*Dr. L. A. Wilson:*

I wonder if I could put a question to both Mr. Haynes and Dr. Degras. In Dr. Degras' work on sweet potato, I think he considered the ratio of tuber weight to total dry matter. Am I right ?

*Dr. L. Degras:*

Yes.

*Dr. L. A. Wilson:*

Now I would like to ask you how you interpret the results of this ratio, and what are your considerations with respect to the results of C9 and O49.

*Dr. L. Degras:*

I think it is very difficult for me to give you an answer about that. My observations on different varieties, and it seems too, that I cannot now make an indication on another way of conditions. I don't know very well.

*Chairman:*

Mr. Haynes, would you like to comment ?

*Mr. P. Haynes:*

I will ask Dr. Spence to answer this one.

*Dr. J. A. Spence:*

Certainly the analysis has to continue into the tuber dry weight in relation to total dry weight. The leaf area produced affects this ratio, and the assessment of final yield and how leaf area affects final yield must be made in relation to this ratio. However, I would not at this stage interpret the results of this ratio for C9 and O49.

*Mr. E. C. Pilgrim:*

We have just been discussing one point, in connection with the chart on the board. Might not the response of O49 be somewhat modified by the fact that C9 is a four-month variety whereas O49 takes six months to mature ? Might not the response have been greater if the graph had been extended for another 2 months.

*Mr. P. Haynes:*

Well unfortunately it was not extended for another 2 months. But I do not know that we can claim that the C9 is going to continue to increase. That phase of the curve is too indecisive for us to make a definite statement as to the trend that it would continue along, for this period of time.

The other thing, which we have to consider — is that total tuber dry matter does not necessarily indicate marketable yield of tubers. When grown for these long

periods, tuber size is becoming rather large, and deformities in tubers begin to appear. This adds a further complication. We still make the contention that this work is aimed at exploring the system rather than making recommendations on practice.

*Dr. B. N. Gosh:*

Now, I am an Agricultural Engineer, and the only reason that I dare speak at this moment is because of the lead given by our Physicist friend, when he mentioned climatic conditions. Sometime ago, we were involved in doing some drying work in East Africa, and it was of importance to know the climatic conditions. We made a comparative study of only one factor, sunshine, over which we have very little control, and we observed values from data from about 8 to 10 stations located within 5 to 6 miles of each other, in a high altitude mountainous area, in two different areas of East Africa, and in both cases we found that the sunshine values obtained at one place bore hardly any relation to another place 3 or 4 miles away. In both instances differences in the average sunshine over a month, taken for a period of 6 to 8 years showed that at the stations the values can be high, or as low by  $1\frac{1}{2}$  hours per day. And I simply quote this figure to emphasise how important it is to observe other factors that contribute towards plant growth.

*Mr. James:*

In describing the yield increases which have been obtained from various trials, or comparing different qualities, I am wondering whether it is not possible to indicate what has contributed to that increase in yield. Whether it is size of tuber or number of tubers, particularly for a crop like sweet potato, in which size is very important, as far as commercial suitability is concerned.

*Mr. P. Haynes:*

In most of these yield increases it has been on the basis of size of tuber increases. There is a small contribution to yield from number of tubers, but usually we find that, with an increased number of tubers their size is smaller, and therefore, this does not usually reflect an increase in marketable yield.