DISCUSSIONS

Dr. Rogers :

First of all, what soil types were used in your plots? Then what are the treatments for giving these other than the irrigation and the fertilizers? Were there any rotations for example? What were the effects on the soil? Was there any increment in the disease populations, after irrigation?

Dr. Hernandez :

First let me say that soil type was a silt loam soil which is the best soil for sweet potato production in our state. In regard to our soil rotation system, normally we grow sweet potatoes in one year and then grow soya bean for two years and come back to sweet potato when we harvest the beans. As far as the effects on the soil are concerned, we have a rotation test that has been in existence for over 8 years, whereby we have maintained a certain type of rotation. One treatment includes sweet potatoes every year and I can tell you that up to date we are producing comparable yields to those we were producing in the first year sweet potatoes were grown on that plot. We use clean seeds at all times, and we have had no disease problems or insect problems on these particular plots. When we harvest our sweet potato roots we turn the vines into the soil. We have been able to maintain our soil productivity throughout the years using recommended rates of fertilizer 6 : 12 : 6 per hundred pounds. Dr. Martin will cover the disease and I would like to defer that problem until he comes.

Prof. Milthorpe :

I'm very interested in these results because these are exactly the same type of response as one finds with the Irish potato, particularly the lower soil moisture and initiation of tubers. I think I may differ a little from you in the interpretation of the mechanism involved. I think there is some evidence which would suggest that the shortage of water leads first to a direct effect on rate of cell division and there is a slowing down on the rate of foliage growth which leads to earlier initiation rather than the direct effect on respiration. The question I really want to ask is what happens with soil moisture deficit later in the season? Do you get any type of response akin to the second growth that one finds in the Irish potato? In other words, do the root tubers stop growing and then with restoration of the water supply start up again leading to mal-formed tubers?

Dr. Hernandez :

Yes, that can become a very serious problem. If you go into a very severe soil moisture depression stage you arrest growth, subsequently when soil moisture becomes adequate and growth is resumed, in many cases the roots crack. This is a genetic character and we screen rigidly to eliminate cracking. Some seedlings will spot all over when that condition is permitted; others will resist the conditions quite well, but there is a tremendous varietal variation.

Professor Steppler :

I would just like to interject for a moment, and ask a question myself, if I may. Water is a limiting factor in many areas and I would like to put two questions to Professor Hernandez. What about the quality of the water on the potato? Can they stand brackish water? And secondly, what is the efficiency of water usage. What is the pounds of water per pound of roots on the irrigated versus the non-irrigated if we are looking at an area where the water is truck supplied?

Dr. Hernandez :

As to the quality of the water, we have a very good experience to relate because at one place where we have a sweet potato station our irrigation water came out with a salinity content of three thousand parts per million, and of course that is prohibitively high. However, we were able to dilute it down to about fifteen hundred parts per million using other levels of water. We used this quality water in 1954 with very good results. About a quarter of the roots were somewhat impaired. But

sweet potatoes can tolerate saline levels say from 600 up to 1000 p. p. m. As to the efficiency of water usage, I would say that the sweet potato can use water very efficiently. Now there are several things to consider. Remember I said that this soil will absorb a half inch of water per water and that's a fairly good water absorption rate. Now many of the soils will absorb much less water, some much more. Now this soil had what we call a 'plough sole' at a depth of roughly 12 to 15 inches, which is impervious and I might add to what I said earlier, that in the plots that we irrigated, feed root systems penetrated very deeply through that 'plough sole' or pan area. However, where we didn't irrigate, our roots concentrated on the plough or on the pan area and were something anywhere from a ¼ to a ½ inch thick of matted fibrous root system. I cannot give exact figures but the increase in yield per acre inch was quite satisfactory.

Mr. Gooding :

I notice you said that if the soil contains available soil moisture the root system grows rapidly, whereas if the soil moisture is very low the roots develop poorly.

I was interested to see this observation as it ties in with observations we have made in Barbados. We had no way of controlling soil moisture and we tried to correlate yield with rainfall, with crazy results. We then took into account measurements of the rate of evaporation of moisture from the soil made by one of my colleagues who had shown that in parts of the island the evaporation rate from bare soil amounted to 0.2 inches per day. Rather arbitrarily, we reckoned that to be really effective the rainfall on any one day would have to exceed 0.2 inches. When we compared the number of inches of 'effective rainfall' that is the excess of rainfall over 0.2 inches per day, with ultimate yield we found a strong correlation between the figures for the first month and the production of tubers. Further we found that the effect of this 'effective rainfall' was mainly on the establishment of the young plants, and in areas where the effective rainfall figure for the first month was in the region of four inches we had final stands of 4,800 plants/acre (almost 100% survival), but where the effective rainfall was in the region of one inch during the first month the stands amounted to only about 2,800 lbs/acre, and the ultimate yields were more or less proportional to the survival of the plants.