Influence of length of the illumination period on root formation in cassava, *Manihot utilissima* POHL

G. G. BOLHUIS
Laboratory of Tropical Crop Husbandry, Wageningen, The Netherlands

Summary

Sprouted cuttings of six cassava cultivars were subjected to treatments with different light periods, 10 h daylight, 10 h daylight plus 2 h weak light, 10 h daylight plus 4 h weak light and 10 h daylight plus 6 h weak artificial light, respectively, in order to study root formation under these conditions. The results make it evident that the optimal light period is about 12 h; longer light periods inhibit root formation; in this respect cassava must be considered as a short-day plant.

1. Introduction

Cassava is a typical tropical plant, which is nowhere cultivated outside the tropics, except in Florida and northern Argentine. According to JONES (1959) the approximate boundaries for its culture may be accepted as from 30 °N to 30 °S. The bulk of cassava growing, however, is located between 20 °N and 20 °S. Temperature plays an important role as all growth stops at 10 °C. The highest production of roots can be expected in the tropical lowlands below 500 ft. altitude where average temperatures amount to 25–27 °C, provided that there is enough moisture during the vegetation period.

On the influence of the length of the day in this crop, to my knowledge, no research has as yet been attempted. As very probably the origin of cassava is situated in the tropical western part of Brasil and also the bulk of cassava cultivation lies well within the tropics it can be expected that cassava is a short-day plant.

In Wageningen cassava was always grown in the hothouses during the summer season with daylengths up to 17 h daylight. Planting was done with sprouted cuttings which had been given extra light up to 12 h during the short winter days. In spring these plants were transferred to the hothouse. During several years it was observed that these plants, originating from several varieties, at harvest in the autumn had produced hardly any thickened roots or no thickened roots at all. In the summer of 1964, however, one cutting accidently got short-day treatment with the result that thickened roots were formed. This finding led to the idea of investigating in how far short-day treatment of cassava plants would influence the formation of thickened roots.

2. Experiment

Sprouted cuttings of six cassava varieties, *Basiorao, Betawi, Bogor, Mangi, S.P.P.*

Received for publication: 15th December, 1965.

(*Sao Pedro Preto*) and *Sao Paulo,* respectively, were planted in carriages on rails which could be transferred into dark sheds where with Philips luminous tubes additional photoperiodic light could be given. By means of powerful fans air was circulated in these rooms so that temperature and humidity in all sheds were the same. The entire setup was enclosed in a glasshouse where during the vegetation period the temperature never did fall below 20 °C. The day temperature sometimes went up to 35 °C. The humidity varied between 70 and 80 %. Owing to lack of space and also lack of sufficient planting material only a very limited number of plants could be included in this experiment. From the cultivars *Bogor, Basiorao* and *Mangi* only one plant was available for each treatment, from the other cultivars two. The treatments were:

a 10 h daylight only
b 10 „ „ + 2 h weak light
c 10 „ „ + 4 „ „ „
d 10 „ „ + 6 „ „ „

Planting was done at 30 March, harvesting was performed at 4 November, the length of the vegetation period under treatment therefore was little more than 7 months.
The planting material was chosen so as to be as much uniform as possible. Generally the plants were growing very well and had to be cut back about two weeks before harvesting owing to the height of the dark rooms.

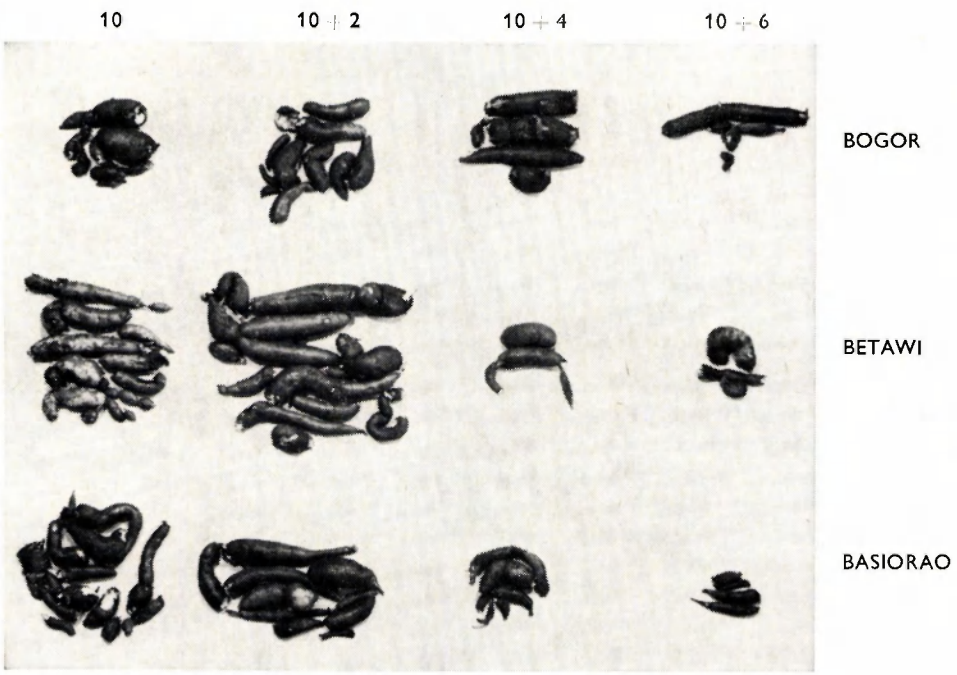

Fig. 1. Samples of root production of single plants under different treatments.

3. Results

After harvesting the roots were weighed per plant and these weights are compiled in Table 1.

Table 1. Weights of roots per cassava plant in grams of plants grown under different light periods

Cultivar	*Light periods*			
	10 h	*10 + 2 h*	*10 + 4 h*	*10 + 6 h*
Basiorao	550	610	165	55
Betawi	548 *	1105 *	160	158 *
Bogor	330	380	520	185
Mangi	415	690	65	0
Sao Paulo	560 *	580 *	244 *	55 *
S.P.P.	1110	643 *	268 *	260 *

* Average of two plants
Some typical samples are represented in Fig. 1.

4. Discussion

Although the number of plants is very small the general trend of the root productions indicates that cassava with regard to root production is a typical short-day plant.

From the figures in the table it is evident that in general 10 + 2 h light is the most favourable light period. From the six cultivars used only *S.P.P.* and *Bogor* fall somewhat outside the general picture. For *S.P.P.* this may be due to the fact that at the 10 h treatment only one plant was available. The cultivar *Bogor* seems to be the least affected by differences in light period. This may be due to differences in critical daylengths between the cultivars. Very striking is the enormous drop in production between the 10 + 2 h and 10 + 4 h treatments. It is therefore clear that under long-day conditions with cassava practically no root formation can be expected. Of the different cultivars used *S.P.P.* and *Sao Paulo* have very poisonous roots and *Betawi* and *Mangi* are quite innocious, but it appears that the degree of poisonousness has no relation to the effects of short or long-day treatment.

The above ground parts of the plants did show no visible differences in development, hence the inhibition of root growth must be entirely due to long-day effects. This is in agreement with the stimulating effect of tuber initiation by short-day treatment as found by KOPETZ and STEINBECK (1954), KRUG (1960) and BODLAENDER (1963).

In his preliminary investigations NJOKU (1963) found in Nigeria that short-day treatment promotes tuber growth in yams. Maximum tuber growth was found at a day length of 12 h.

Although yams, potato and cassava differ in the botanical nature of the storing organs, it seems that the above mentioned conclusions for yams and potatoes are applicable for cassava too.

REFERENCES

BODLAENDER, K. B. A. 1963 Influence of temperature, radiation and photoperiod on development and yield. The growth of the potato. *Proc. 10th Easter School Agric. Sci., Nottingham,* 119–210.

BOLHUIS, G. G. 1954 The toxity of cassava roots. *Neth. J. Agric. Sci. 2 (3),* 176–185.

JONES, W. O. 1959 Manioc in Africa. Stanford Univ. Press.

KOPETZ, L. M. and STEINBECK, O. 1954 Photoperiodische Untersuchungen an Kartoffelsämlingen. *Züchter 24* (2/3), 69–77.

KRUG, H. 1960 Zum photoperiodischen Verhalten einiger Kartoffelsorten. *Eur. Potato J. 3,* 47–79.

NJOKU, A. 1963 The propagation of yams (*Dioscorea* spp.) by vine cuttings. *J. W. Afr. Sci. Assoc. 8 (1),* 29–32.