# SOME PHYSICAL ASPECTS OF CROP ENVIRONMENT IN IBADAN AND POSSIBLE IMPLICATIONS ON CROP PERFORMANCE

by

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## INTRODUCTION:

The importance of the physical environment, both aerial and edaphic, to crop production can hardly be overstressed - certainly not to a group of eminent plant physiologists. A meaningful definition of such an environment in terms of relevant variables is or should, therefore, be a matter of equal importance in an attempt such as ours to set up or effect a "green revolution" in the humid tropics. Efforts in the Agroclimatology subprogram here at IITA consequently have been geared mainly towards a sound characterization of this region of mandate in terms of agroclimatic variables and a delineation of agroclimatically suitable areas and periods for growing the various crops of interest and socio-economic importance.

As a starting point, an analysis of the climatic records for this area (site of the Institute) and of subsequent observations since the beginning of the subprogram, revealed what might be termed a basic difference between the two cropping (rainy) seasons (Fig. 1) characteristic of the area. Rains in

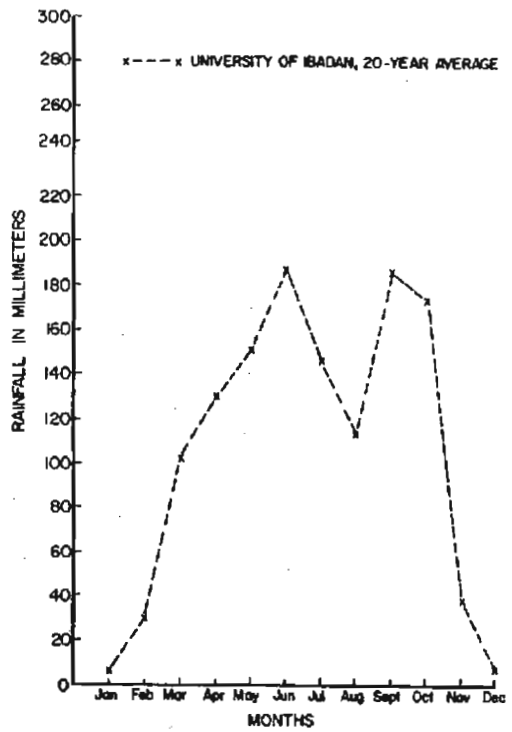


Fig. 1: 20-year mean monthly rainfall (University of Ibadan).

the first season are mostly of the convective type, with what appears to be a preference for evening and nighttime occurrences. This season is, therefore, marked by a relatively higher light regime compared with the second when persistent stratiform clouds appreciable reduce insolation, particularly early in the season (Fig. 2, Table 1). Attendant lower crop yields, notably

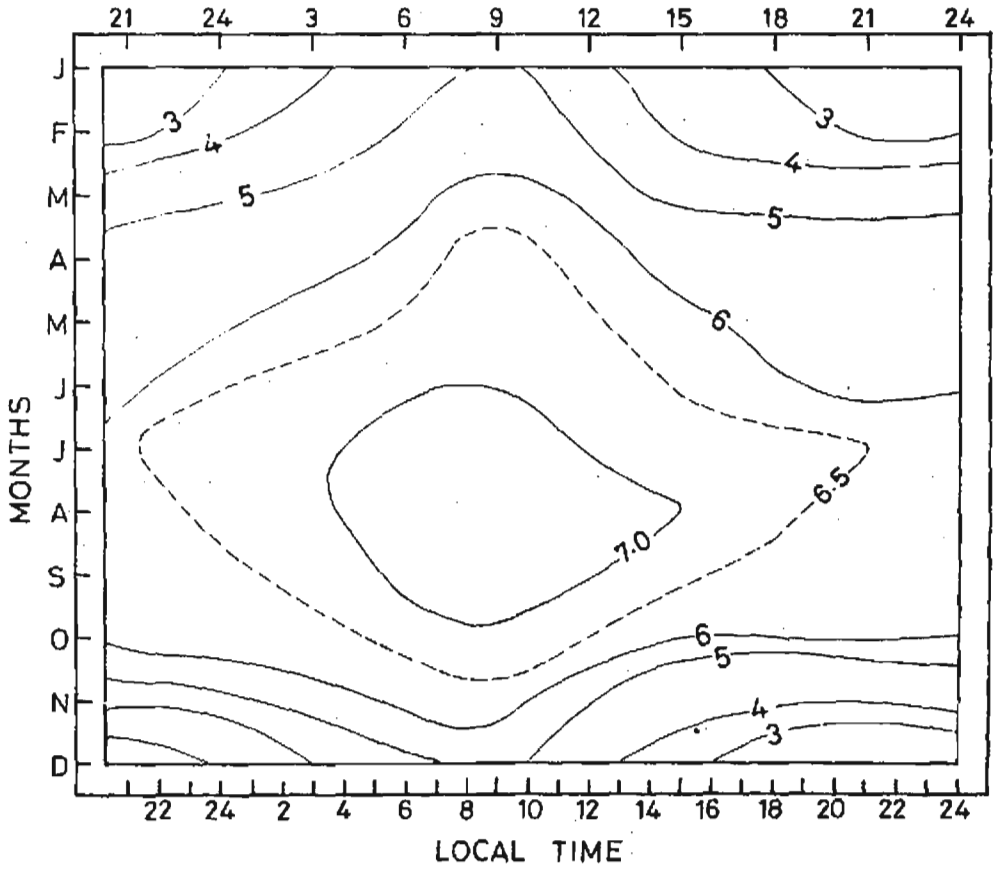


Fig. 2: 18-year average mean cloud amounts at Ibadan Aerodrome (1949-1966).

Table 1. Mean Daily 'Actual' Hours of Sunshine* (hrs/day).

| J | F | M | A | M | J | J | A | S | O | N | D |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 6.7 | 7.2 | 6.6 | 6.3 | 6.7 | 5.3 | 3.4 | 2.6 | 3.5 | 5.6 | 7.2 | 7.2 |

*Based on observation at the University of Ibadan, 1953-72.

in maize, reported for the second as compared with the first season have prompted a set of experiments aimed at determining the possible relationship or association between light and other agroclimatological factors and these yield differences. These studies are indeed still in progress but it has been deemed relevant to present here some preliminary observations and results for discussion within the frame-work of this workshop.

SYNOPSES OF EXPERIMENTAL OBSERVATION AND RESULTS:

In the first area of study loosely entitled 'The role of agroclimatological factors in maize development and yield', a sequential method of planting has been adopted, with planting done every two weeks. Routine weather observations including global radiation, soil temperature and moisture (the latter by gravimetric method) within the plots, air temperature and relative humidity in a standard screen, wind speed, rainfall and pan evaporation are taken along with phenological observations throughout the growing periods. The environmental variables were averaged over the 1st and 2nd six weeks periods of growth, corresponding approximately to the pre-flowering and post flowering periods, respectively.

A delay in flowering was observed under relatively lower light regime during the 1st six weeks of growth (Fig. 3), with

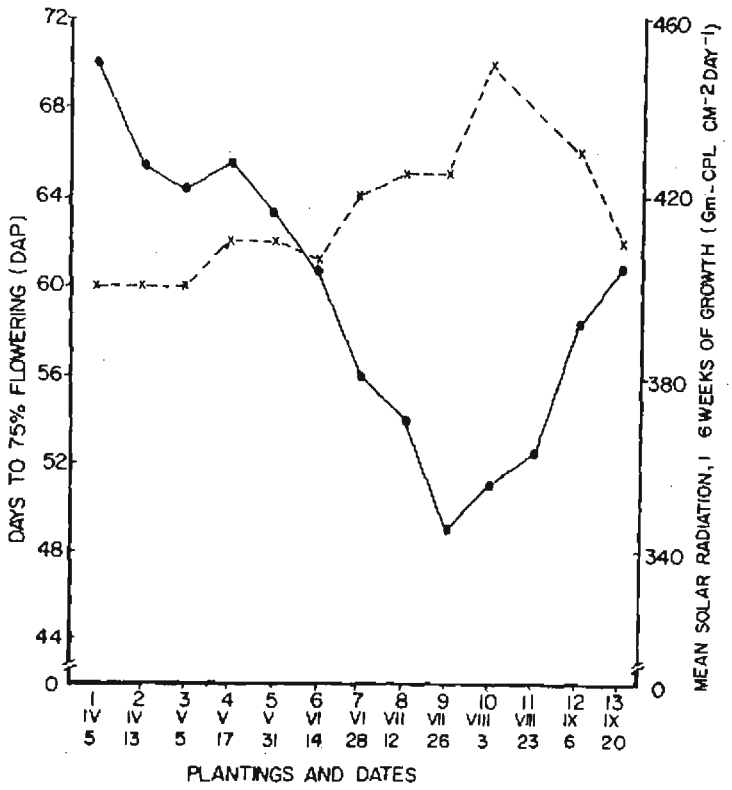


Fig. 3: Relationship between days to 75% flowering (male) and radiation climate in the 1st six weeks of growth (1974)

che difference in days to 75% flowering in the 1st season plantings (April through 1st half of June) and the 2nd season plantings (end of June-September) being of the order of 5-6 days. There was a more or less progressive decline in yield from the beginning towards the end of each season, with a highly significant difference between the average yields of the two seasons (Fig. 4). Preliminary regression analyses

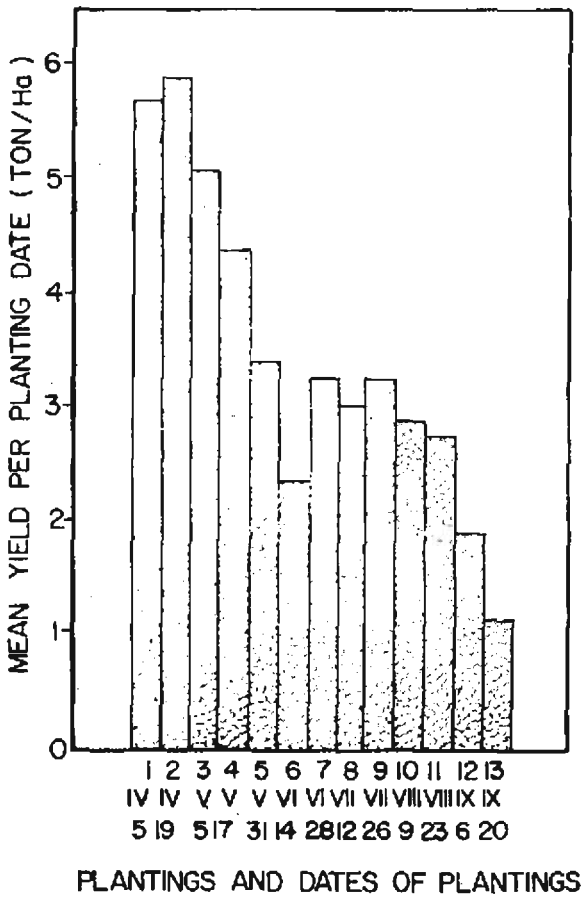


Fig. 4: Maize yield with time of planting.

show the trend in yield to be largely due to available energy (light, temperature) mainly during the 1st six weeks, and moisture during the 2nd six weeks of growth.

In a companion experiment designed to get a better understanding of the role of light in the above multi-factor study, a controlled light regime was set up by means of a chicken wire screen shed. Planting was done under and outside the structure which effectively reduced incident global radiation by about 15%, roughly simulating conditions which prevail between the

1st and 2nd season here at IITA or between Ibadan and the more humid areas to the South east, during the same season.

As observed in the sequential plantings, a delay in flowering was noted with the reduced light regime, and by nearly comparable number of days, (Fig. 5). The grain yield

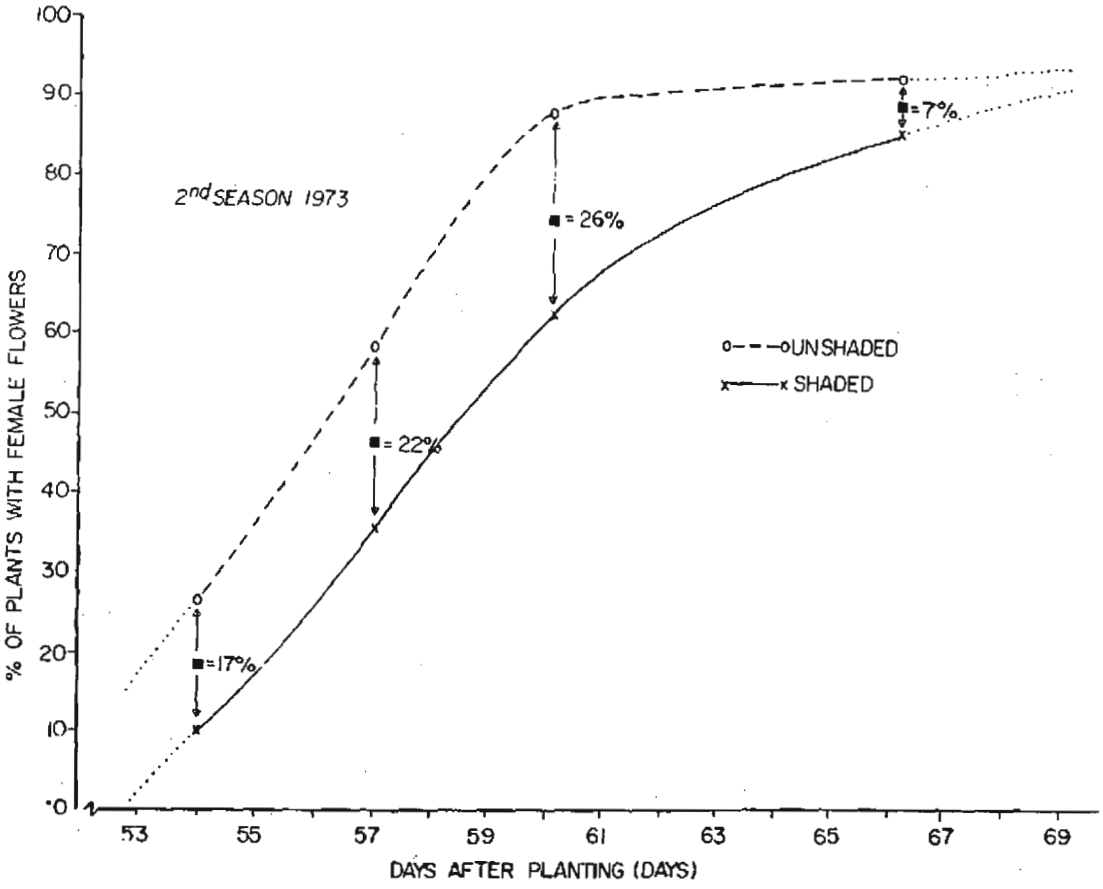


Fig. 5: Influence of radiation intensity on flowering in maize.

in full natural light was about 40% higher than that under shade. There was substantial difference in number of grains per ear from the unshade plot (438) as compared to the shaded one (360) but the weights of 100 grains under the two conditions were virtually the same - 22.4 gm and 22.5 gm, respectively. The above difference in yield appears, therefore, to be principally due to the greater grain number per ear from the plot with full light.

CONCLUSION:

The above studies are giving us some insight into the possible effects of the environment of concern on crop growth and yield and will be looked into in more details in the immediate future. In addition work on crop water requirement will constitute another major area of endeavor.