

## INTRODUCTION

Most writers in the past have summed up the position concerning shade for cacao by observing that some shade is beneficial and probably necessary and have left it at that. Within the last decade more interest has been shown in the question of shade and more especially in the optimum light intensity for maximum growth and yield. Various authors have discussed the physiological implications of shade requirements. Its importance seems to be to reduce transpiration, and to maintain a humid atmosphere and even temperature around the plants. Shade also protects the soil and conserves moisture by reducing evaporation and preventing drought conditions in the plant. Light intensity affects the growth rate and may alter respiration and photosynthesis. Alvim (1952) in Costa Rica has stated that with an adequate water supply, cacao does not need shade for the purpose of reducing transpiration. He suggests that the low resistance of cacao leaves to desiccation and the rapid closure of stomata under a slight water deficit are probably the main reasons why cacao requires shade and high humidity. Cobley (1942) assumes that the light intensity which cacao experiences in its natural habitat, presumably South America, is the optimum light intensity for growth. Without any experimental evidence this statement is unjustified and all that can be reasonably assumed is that light which wild cacao thrives best in, is that at which it can most readily compete against other forest species. Hart (1911) states that unshaded cacao invites insect pests whereas too heavily shaded plants are more susceptible to damage by fungal attack. It is the practice in Trinidad to provide temporary shade in the form of cassava and banana for young plants and permanent shade of *Erythrina* spp. for the mature trees. The use of such large trees as shade brings in complicating factors such as inter-specific competition for moisture, soil nutrients and root room, all of which must be taken into account when an analysis is done of the effect of shade on cacao.

In 1950 an experiment was laid down at the Imperial College of Tropical Agriculture, (Murray and Evans 1951), to try to find the light intensity for the optimum growth of young cacao. Treatments of 15, 25, 50

75, and 100 % of full sunlight were provided by overhead bamboo slats to regulate the amount of light. This eliminates the effect of root competition from shade trees and of contributions of nitrogen from leguminous nodules. Manurial treatments were also incorporated into the experiment.

Among the results to date on what is essentially a long-term experiment, the main ones have been to demonstrate that the most vigorous growth occurs in the 25 and 50 % plots, intensities above and below this level resulting in reduced and less healthy growth. The low light intensities produced lax spreading plants whereas above 50 % the plants lost the early habit of fan cuttings and tended to be bushy. The leaf colour was a very deep green in low light. The fertiliser treatments were only obvious at and above 50 % light and increased with increasing light. This is particularly the case for nitrogen and potassium, but much less so for phosphate. These results only apply to the early stages of the experiment but treatment differences have been quite marked.

As a consequence of the results from the above experiment, in this present experiment it was planned to grow cacao cuttings in culture solution at different levels of potassium supply and at varying light intensity. Growth in the culture solution should ensure uniformity of factors such as mineral nutrition and moisture availability. By analysis of the plants and of the culture solutions it should be possible to follow growth rates, assimilation rates and mineral uptake in detail under the different experimental conditions. In this experiment the only effect of shade will be to change light intensity, humidity and to some extent temperature and thus a more accurate picture of the effect of shade uncomplicated by soil and root factors can be obtained.