

CHAPTER 1

GENERAL INTRODUCTION

Sweet sorghum (*Sorghum bicolor* L. Moench) belongs to the same species as grain sorghum, grass sorghum and broom sorghum (Doggett, 1970). This sorghum is characterized by abundant sweet juice in the stalks and the height usually ranges from 1.5 m to 3.0 m (Martin, Leonard & Stamp, 1975). A number of reports have shown that sweet sorghum is a potential source of sugar and a multipurpose industrial crop (Cowley & Smith 1972; Ferraris & Stewart, 1979; Inman-Bamber, 1980).

In Botswana sweet sorghum is widely grown by almost every farmer, though on small scale. It is grown mainly for its sweet stems which are chewed as a snack and to quench thirst while working in the fields. It is commonly grown in mixtures of crops such as maize, grain sorghum, cowpea, groundnut and melon (Harris, Fry, Miller & Pain, 1992). The stalks are sold as delicacies at roadside stalls. Hence, the crop has recently attracted interest as a potential cash crop for small scale farmers.

Sweet sorghum is adapted to the climatic conditions of Botswana, which may be described as semi-arid with rainfall mostly confined to the summer months between October and March. Mean annual rainfall varies from 650 mm in the northeast to about 300 mm in the southwest of the country (Harris *et al.*1992). Average daily maximum temperatures are around 33°C in January and 22°C in July, and the daily minimum average as low as 12°C in January and 5°C in July (Harris, *et al*, 1992).

Frosts are common in winter. Generally, the soils of Botswana are sandy to sandy-loams and low to very low in nutrients and organic matter. The most serious deficiency in Botswana soils is usually phosphate. Due to erratic rainfall, high evaporation and freely draining sandy soils, intra seasonal drought is common. Because of its drought tolerance, sweet sorghum can survive severe droughts and is often an important source of income before harvesting grain sorghum and other surviving crops.

Growers of sweet sorghum are faced with a number of problems in trying to improve the quality of the crop. Poor crop establishment is one of the problems suspected to be due to poor seed quality. Seed harvesting is done when the stems are ready for sale and not necessarily when the seeds have reached physiological maturity. Other problems are low sucrose levels in the juice and lack of uniformity in height and thickness of stems. Farmers have also indicated that the sweetness in the stems is deleteriously affected by late planting, high amounts of organic manure, too much rain and harvesting too early or too late. Since the crop is probably never grown in monoculture systems, the effect of spacing on the quality of the stalks and juice is not known. Poor stem quality caused by either insects or diseases is another important problem in the production of sweet sorghum. Most of these problems result from a lack of knowledge regarding effective cultural practises for this crop.

Since sweet sorghum is seen as a potential cash crop for small scale farmers, more information is needed on the phenology and management of the crop. Such information will help to develop appropriate and affordable cultural practices for improving the quality of sweet sorghum. In this study, the main objective was to

contribute towards improved sweet sorghum production in Botswana through a better understanding of the agronomy of the crop.

The approach was as follows:

(i) The limited amount of available information on sweet sorghum in southern Africa and elsewhere was scrutinized. Most of the published information is from the United States, Australia and India where the crop enjoyed some popularity during the early stages of the twentieth century (Ferraris & Stewart, 1979).

(ii) Germplasm was collected from different parts of Botswana, targeting small scale farmers growing sweet sorghum. During this exercise some information about the crop was acquired from farmers. Sixty-five landraces were collected and seed vigour and quality were tested. The effect of early harvesting on seed quality in sweet sorghum was also investigated.

(iii) A total of ten accessions from the landrace collection were characterized to understand agronomic performance in the field and identify traits which can be used in future improvement programmes.

(iv) Field experiments were conducted to determine the effects of panicle removal (deheading) and tiller removal, planting date, spacing and nitrogen on the stem yield and sucrose concentration of sweet sorghum.