

INTRODUCTION

Sugarcane (*Saccharum officinarum*) is one of the most important commercial crops in the world which is known to mankind from very early times. This plant yields sucrose which is one of the most essential commodities in the day to day life. The baggasse left after sugar extraction is used as a source for paper. The molasses produced during this process is extensively employed for manufacture of large number of metabolites. When we are approaching the dawn of 21st century, sugarcane is being recognized as an energy crop thus this is indeed as multipurpose crop.

It is interesting to know that the efficient C_4 photosynthetic process was discovered for the first time in this plant. It is one of the first tropical crops to be adapted to large scale farming. The length of growing season varies from less than 9-10 months in America, two years in Peru and South Africa and two years of more in Hawaii. In countries like India sugarcane is grown as a 14-18 months crop. Unlike other crops flowering is the most undesirable event in the life cycle of sugarcane from the commercial view point.

Cane sugar is produced commercially in over 70 countries, territories and island groups, generally within

band around the world bounded by 35° N and 35° S latitudes. According to latest estimates of Licht, world sugar production in 1992-93 is expected around 113.01 million MTRV or about 2.87 million MTRV lower than the production in 1991-92.

Lichts estimate of production in major producing countries in 1992-93 together with comparative figures of previous two years are given below.

Country	1990-91	1991-92	1992-93
India	13,093	14,572	12,000
Brazil	7,835	9,365	9,950
Chiana	6,880	8,578	8,240
CIS	9,541	6,418	6,462
USA	5,601	5,838	6,448
Cuba	7,729	7,000	5,700
France	4,736	4,412	4,736
Germany	4,675	4,250	4,394
Australia	3,612	3,195	4,360
Mexico	3,943	3,670	4,170
Thailand	4,053	5,106	3,820
Pakistan	2,100	2,528	2,703
Indonesia	2,311	2,257	2,377
Turkey	1,946	2,052	2,065
Italy	1,586	1,640	2,032

Country wise the highest production is expected in India with an estimate production of 12 million MTRV. However, this is about 2.35 million MTRV lower than the production in 1991-92.

In India the area under sugarcane increased from 2.5 million hectares in 1968-69 to 3.7 million hectares in 1991-92. Production also rose from 124.6 million tonnes to 249.25 million tonnes (Lal et al., 1993). Sugarcane is main cash crop in Maharashtra. In 1982-83 there were only 326,000 hectares were under sugarcane cultivation. In 1993-94 the area has raised to 344 million hectares. Production also goes to about 27892 million tonnes which is second stage production in India. U.P. comes first in production of sugar. But yield of sugarcane/hectare is 81.1 tonnes/hectare which is third stage in India.

There have been continuous attempts to increase sugarcane yields either through improvement in the cultural techniques or other development of new sugarcane varieties. Engineering technologies have also made tremendous advances and they are of great help in sugarcane growing developed countries. The fertilizer industry in general and application of nitrogen fertilizers in particular have also caused significant increase in sugarcane in some parts of the world. The plant breeders at Sugarcane Research

Institute Coimbatore and Hawaiian Sugarcane Planters Association have greatly attributed to sugarcane breeding work and their continuous effects have yielded several promising varieties of sugarcane suited various regions of the world.

The chemical manipulation of sugarcane growth and development is another promising strategy in this respect. According to Nickell (1983) plant growth regulators have been used in the sugarcane industry world wide for over two decades to increase recoverable yield of sucrose in sugarcane. The work carried out at several research stations has very well documented that the various plant growth regulators are capable of exerting positive influence on different phases of sugarcane development i.e. from planting to harvest. However many of the studies have been carried out employing foliar application of plant growth regulators on sugarcane crops. Although such applications on large scale are possible in developed countries like America. This approach is not very much visible in developing countries like India. There is another possible way of employing plant growth regulators and this is to be way of presowing soaking treatment. This technique is known under different names such as seed advancing, seed hardening and seed priming and this had shown several positive effects in crops like wheat.

The work mentioning attempt in this respect has been made by Chinoy, Saxena and other workers at Ahmedabad highlighting the role of ascorbic acid pretreatment in crop growth, development and stress resistance. In case of sugarcane also few attempts have been made to study effect of seed pretreatments. However it must be mentioned that the physiological basis of these effects has not been thrully investigated in these attempts. Hence it was thought over worthwhile to undertake such study in sugarcane. For this purpose the author has selected two plant growth regulators chlorocholine chloride and ethephon. Since there wide attention paid to these plant growth regulators by agriculturists rather than to the natural phytohormones. The variety (CO-671) selected to present investigation is also quite popular in sugarcane growing belt of Maharashtra.

The thesis is divided into three chapters in order to understand the role of plant growth regulators in sugarcane production and sugarcane physiology. A review of literature on response of sugarcane to plant growth regulators has been taken and this forms the substance of first chapter. The methodology fallowed for investigation has been described in details in second chapter of thesis. The findings are presented and discussed in the light of available literature in third chapter results and

discussion. In this chapter influence of presowing soaking treatment of distilled water, CCC and ethephon on physiological processes in the sugarcane buds (before sprouting), growth and yield characteristics of sugarcane, mineral nutrition and fate of some important metabolites has been described. The significant findings are briefly summarise following this chapter. The thesis ends in a systematic bibliography of literature cited in the thesis.

Understanding the physiology of crop is off great significant if any attempt is to be made to increase the productivity of the crop. With this view in mind extensive work on stress physiology and pathophysiology of sugarcane has been carried out in our laboratory under the leadership of late Dr. G.V. Joshi and late Dr. J.D. Nimbalkar since last 25 years. It must be admitted here that the present work represent a small extension of these research work.