INTERNATIONAL JOURNAL OF APPLIED BIOLOGY AND PHARMACEUTICAL TECHNOLOGY

Volume: 2: Issue-2: April-June -2011 IJABPT *ISSN 0976-4550*

EFFECT OF SULPHUR ON QUALITY OF SUGARCANE JUICE AND JAGGERY

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ABSTRACT: Results of the experiment conducted in sandy loam soils during 2006-07 and 2007-08 revealed that quality parameters of cane juice and jaggery were positively and significantly influenced by the application of sulphur irrespective of sources of sulphur. Application of sulphur at 100kg/ha had significantly influenced the quality of juice but it was comparable with the application of sulphur at 80kg/ha which was reflected in quality of jaggery. There is an increase of 1.27 units in juice sucrose was observed with the application of sulphur at 80kg/ha. But sources did not differ markedly on juice quality and jaggery quality parameters. As Gypsum is cheapest source compared to Elemental sulphur, it can be concluded that maximum returns can be obtained at 80 kg S/ha through Gypsum application.

Key words: Cane juice quality, jaggery quality, sources and doses of sulphur

INTRODUCTION

Sulphur is an important plant nutrient required for its growth and development. It is one of the essential plant nutrients assuming large scale importance in the crop production. The increasing incidence of sulphur deficiencies both in soils and crops is a world wide phenomenon (Tandon, 1991) caused by prolonged use of sulphur free fertilizers. Sugarcane being a long duration crop is likely to respond more to sulphur application. Saroha and Singh (1980), Ghosh *et al* (1989, 1990) and Alam *et al* (2000) observed a positive and significant effect of sulphur on quality and yield of sugarcane. The critical level of available sulphur is fixed as 20 ppm for sugarcane. Higher yields of sugarcane crop require higher amounts of sulphur from the soil (Shanmugam, 1987). Response of major nutrients (N, P and K) has been intensively studied on quality of cane juice and also to some extent on jaggery. As far as sulphur is considered, its application in sugarcane is limited. Influence of sulphur on yield and juice quality of sugarcane has been reported by some workers and so far little work has been reported on the effect of sulphur on the quality of jaggery. Keeping this in view an experiment was conducted to study the effect of sulphur on quality of juice as well as jaggery.

MATERIALS AND METHODS

An experiment was conducted at Agricultural Research Station, Perumallapalle during 2006-07 and 2007-08. The soil of the experimental site are sandy loam in texture, neutral in pH, normal in EC, low in organic carbon, low in available nitrogen, low in available phosphorus and high in available potassium and deficient in available sulphur (Table 1). The trial was laid out with three replications in factorial RBD. The sulphur was applied through two sources viz; Elemental sulphur and Gypsum at five levels (0, 20, 40, 60, 80 & 100 kg S/ha). Gypsum was applied at the time of planting where as elemental sulphur was applied three weeks before planting according to treatments. A uniform dose of 224 kg N, 112 kg P_2O_5, 112 kg K_2O/ha was applied through urea, di ammonium phosphate and muriate of potash respectively to all the treatments. The juice quality parameters viz Brix %, sucrose %, pol %, CCS % were determined at harvest as per the standard procedures (Spencer and Meade, 1977). The data was pooled and statistically analysed. Jaggery was prepared at harvest according to treatments and dried for two days under shade. Samples were collected for analysis of quality parameters. Brix, sucrose, purity, color, glucose %, and sulphur content were estimated according to standard procedures (Asokan, 1983).

Table 1 : PHYSICO CHEMICAL PROPERTIES OF EXPERIMENTAL SITE

pH	7.8
EC (dS/m)	0.18
Texture	Sandy loam
Organic carbon (%)	0.21
Available N (kg/ha)	230.8
Available P_2O_5 (kg/ha)	14.16
Available K_2O (kg/ha)	360
Available sulphur (kg/ha)	6.4

RESULTS AND DISCUSSION

Data on variation of quality of cane juice and jaggery due to different sources and levels of sulphur are presented in Tables 2 and 3.

Table 2: EFFECT OF SULPHUR ON JUICE QUALITY OF SUGARCANE

	SUCROSE %	**PURITY %**	**CCS %**	**CCS yield (t/ha)**
SOURCES				
Elemental sulphur	18.97	92.46	14.97	15.96
Gypsum	19.34	92.76	15.34	16.40
CD@0.05	**NS**	**NS**	**NS**	**NS**
DOSES (kg S/ha)				
0	18.55	90.99	12.75	14.07
20	18.77	91.63	12.93	14.55
40	19.00	91.94	13.52	15.86
60	19.11	92.54	13.48	16.05
80	19.82	94.57	13.63	17.38
100	19.98	95.58	13.75	17.83
S.Em	**0.28**	**1.16**	**0.29**	**0.50**
CD@0.05	**0.76**	**3.16**	**NS**	**1.36**

Table 3: EFFECT OF SULPHUR ON QUALITY OF JAGGERY

	Brix %	**Sucrose %**	**Purity %**	**Color intensity**	**Glucose %**
SOURCES					
Elemental sulphur	93.41	88.96	95.24	69.7	3.13
Gypsum	94.70	89.3	94.29	63.8	2.87
CD@0.05	**NS**	**NS**	**NS**	**NS**	**NS**
DOSES kg S/ha					
0	89.6	80.1	89.39	79.8	3.40
20	92.1	82.5	89.58	73.0	2.81
40	93.7	85.2	90.93	69.8	2.23
60	94.8	86.8	91.56	65.4	1.86
80	96.2	88.9	92.41	62.1	1.50
100	97.1	89.9	92.58	60.8	1.39
S.Em	**0.36**	**0.33**	**0.86**	**0.60**	**0.19**
CD@0.05	**1.04**	**0.96**	**2.49**	**1.74**	**0.55**

Juice quality

Brix and sucrose content in cane juice increased with increasing levels of sulphur up to 100 kg/ha but it has shown statistical parity with sulphur application at 80 kg/ha. There is an increase of 1.27 units in juice sucrose was observed with the application of sulphur at 80 kg/ha. These results were in agreement with finding of Saroha and Singh (1980), Ghosh et al (1990) and Prasad et al (1996). Purity coefficient also significantly increased. Gupta and Shukla (1974) and Prasad et al (1996) also reported that increasing dose of sulphur significantly increased the purity coefficient. However both the sources of sulphur i.e gypsum and elemental sulphur did not differ markedly in their effect on juice quality. Application of sulphur at 100 kg/ha significantly increased the sugar yield over control and it was at par with that observed with application of 80 kg S/ha. The increase in sugar yield was primarily due to the beneficial effect of sulphur in raising cane yield per unit area. Similar results were reported by Satisha et al (1996).

Jaggery quality

Brix % of jaggery significantly increased with increasing levels of sulphur up to 80 kg/ha (Table 3). Sucrose % of jaggery also significantly increased with increasing levels of sulphur up to 80 kg/ha. Increase in brix, sucrose % in cane juice was also reflected in brix and sucrose % of jaggery which is its desirable characteristics. Purity of jaggery also followed the similar trend. Similar results were reported by Singh (2001). Color intensity significantly decreased with increasing levels of sulphur up to 100 kg/ha over control. From low color intensity, golden yellow jaggery was produced which is preferred over dark color and generally fetch high returns to the farmers. Glucose content of jaggery significantly decreased up to 80 kg/ha over control. Similar results were reported by Patil et al (2003). Combined effect of high sucrose with low glucose content helps to induce crystalline texture of jaggery. Electrical conductivity of jaggery was also determined and decreasing level of EC was observed with increasing levels of sulphur which indicates its keeping quality during storage. However source of sulphur did not affect the quality of jaggery. For production of good quality jaggery, high sucrose and high purity combined with low colour intensity, low glucose and low EC are important desirable characteristics. With the application of 80 kg sulphur /ha, there was an improvement in quality of cane juice and jaggery.

Economics in the maximum net monetary returns were obtained with the application of 80 kg S/ha in the form of gypsum compared to elemental sulphur as cost of elemental sulphur is higher than gypsum. The present study suggested that application of sulphur at 80 kg /ha in the form of gypsum was effective in increasing juice quality as well as jaggery quality and was economical in sulphur deficient sandy loam soils.

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