

EVALUATION OF PROXIMATE COMPOSITION OF FRUITS OF *Lycopersicon esculentum* (Roma VF) UNDER STRESS AND STAKING

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ABSTRACT

The effects of salt (CaCl_2) and staking on the proximate composition of fruits of tomato (Roma VF) were studied at the Department of Botany Experimental garden, University of Uyo, Nigeria. Calcium chloride salt levels of 0, 50, 100, 150 and 200g per 4Kg of loamy sandy soil were used, with and without staking. The moisture, dry matter, ash, crude fat, crude protein, carbohydrate and crude fibre contents in treatment with calcium chloride/ staking were significantly ($P < 0.05$) higher than those of calcium chloride without staking in Roma VF. CaCl_2 and staking treatment increased the crude protein content of the crop. 100g level of CaCl_2 salt was the optimum level for enhanced proximate composition of the crop. Improved processing qualities of tomato fruit (Roma VF) can be enhanced through regulated salt and staking treatment.

KEY WORDS: Proximate composition, salt stress, staking and *Lycopersicon esculentum*

INTRODUCTION

Tomato (*Lycopersicon esculentum* Mill) belongs to the family Solanaceae, and is grown mainly for its fruits, in view of its dietary importance (Bertin, 2005). Agronomic management requirement and salt tolerance level affect plant growth and development (Schippers, 2000; Odoemena, 2006). The physiological reaction of salts is one of the major factors determining the uptake of nutrients by plants (Munns *et al.*, 2001) hence may affect the nutritional values and essential biochemical attributes for processing. Salt stress differ considerably from one plant to another, and the variation in tolerance results in differential growth response of crops to saline medium (Rengasamy, 2006; Munns *et al.*, 2001). Therefore, this study was aimed at evaluating the response of Tomato (Roma VF) to salt stress and agronomic management requirement of staking.

MATERIALS AND METHODS

Seeds of the tomato cultivar (Roma VF) obtained from Horticultural Research Institute Okigwe Seed Bank were sown in a nursery consisting of a perforated wooden box (45 X 60cm) filled with loamy sandy soil mixed with poultry droppings for germination in June, 2003. Seedlings were transplanted after 4 weeks to the experimental site. The experimental treatments consisted of 0 (control), 50, 100, 150 and 200g of calcium chloride (CaCl_2) with and without staking. Four kilograms of loamy - sandy soil (0 – 45cm depth) obtained from the fallow land within University of Uyo Botanic and Horticultural farm, Akwa Ibom State were weighed and thoroughly mixed with poultry droppings, in the proportion of two parts of soil to one part of poultry manure (Odoemena, 2006). It was left for 7 days before transferring the seedlings into perforated polythene bags (18 X 36cm). Uniform and healthy

seedlings of the cultivar were differently transplanted into each of the prepared perforated polythene bags (1 seedling per poly bag) containing the poultry manured soil. Staking was done 2 weeks after transplanting as part of the treatment except for those of the control treatment. Calcium chloride treatment, which commenced 18 days after transplanting and lasted for 5 weeks, was done by dissolving each treatment amount in 1 litre of distilled water (Francoise *et al.*, 1984). The entire experiment was repeated two times. Each level of treatment was replicated 4 times and arranged in a randomized complete block designed. The experimental work was maintained under natural light condition, the plants watered as need arose, and sprayed weekly with Dithane – M45 (Dithio – Carbonates fungicide) and Vetox 85 at the rate of 30g to 9 litres of water (Agale *et al.*, 1999). The plants were allowed to grow for 79 days (after transplanting) in order to determine the growth and yield components. Data were subjected to analysis of variance according to the method of Obi (2002)

RESULTS

The moisture, dry matter, ash, crude fat, crude protein, carbohydrate and crude fibre contents in treatment with calcium chloride / staking were significantly ($P < 0.05$) higher than those of calcium chloride without staking (Table 1 and 2). Treatment levels with low concentration of CaCl_2 salt (50 and 100g) gave significant ($P < 0.05$) increase in proximate compositions of Roma VF over that of the control. 100g level of CaCl_2 salt was the optimum level for enhanced proximate composition of the crop (Table 1 and 2). The crude fat, dry matter and crude protein contents of the crop also increased with increase in the CaCl_2 salt level for the two treatments (with or without staking) (Table 1 and 2). CaCl_2 salt with staking treatment effect

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decreased the moisture, ash and carbohydrate contents of Roma VF, at 150 and 200g treatment level, while 200g treatment level of CaCl₂ salt with staking decreased the crude fibre content of the crop, compared with the control (0) treatment (Table 1). In addition, there

were reductions in moisture, ash, carbohydrate and crude fibre contents of the crop at higher CaCl₂ salt levels without staking compared with the control (Table 2).

TABLE 1: Effect of Calcium Chloride / Staking on Proximate Composition of Tomato (Roma VF)

Treatment: CaCl ₂ (g)/ Staking	Moisture content (%)	Dry matter (%)	Ash content (%)	Crude fat (%)	Crude protein (%)	Carbohydrate (%)	Crude fibre (%)
0	84.85±0.95	8.15±0.14	11.00±0.20	16.05±0.30	18.90±0.16	41.64±0.52	7.30±0.15
50	89.74±0.75	14.26±0.15	10.00±0.16	16.74±0.41	20.39±0.15	43.27±0.30	8.18±0.12
100	95.76±0.59	16.24±0.13	14.50±0.32	23.38±0.14	25.61±0.20	59.51±0.16	8.49±0.16
150	83.70±0.79	17.32±0.10	9.50±0.13	27.91±0.31	32.23±0.34	37.35±0.31	8.07±0.12
200	75.10±0.51	19.90±0.12	7.50±0.26	28.38±0.20	34.37±0.14	34.53±0.46	6.20±0.30

Mean ± Standard error (P<0.05)

TABLE 2: Effect of Calcium Chloride / Staking on Proximate Composition of Tomato (Roma VF)

Treatment: CaCl ₂ (g)/ without Staking	Moisture content (%)	Dry matter (%)	Ash content (%)	Crude fat (%)	Crude protein (%)	Carbohydrate (%)	Crude fibre (%)
0	73.26±0.39	6.21±0.31	9.00±0.43	12.32±0.17	15.30±0.24	32.40±0.19	5.32±0.09
50	80.25±0.52	12.32±0.26	8.50±0.40	14.70±0.32	17.32±0.30	34.16±0.10	6.10±0.48
100	77.46±0.67	13.20±0.17	12.50±0.19	18.31±0.19	20.40±0.46	47.32±0.22	7.64±0.42
150	63.46±0.28	14.02±0.14	8.10±0.30	20.21±0.31	24.52±0.17	28.67±0.15	5.02±0.22
200	62.25±0.46	16.22±0.21	6.10±0.16	21.20±0.22	29.20±0.23	26.12±0.20	4.27±0.40

Mean ± Standard error (P<0.05)

DISCUSSION

The disparities evident between CaCl₂ salt / staking and CaCl₂ salt without staking treatments in proximate composition of Roma VF can be attributed to variation in the agronomic practice used for the two treatments. This result agrees with the work of Agbede (2009), who reported that, the nutrient composition of plant materials vary with the age, cultural practices, environment, the season and the varieties. Staking is an agronomic management requirement for enhanced plant development, particularly in erect types cultivars that requires external support (Udo *et al.*, 2005).

The decrease in moisture contents with increasing levels of CaCl₂ salt in Roma VF was evident for both staking and non-staking treatments against the increased dry matter contents of the crop. This result agrees with the reports of Nobson and Grierson (1993), that under an increased salt content of the soil, water rather than dry matter accumulation by the fruit was affected.

The crude protein content of Roma VF increased with CaCl₂ salt application. Increase in protein content observed in this study agrees with the findings of Cusido *et al.*, (1987), and Gupta and Gupta, (2005) who reported that high salt application increase protein synthesis. Accumulation of certain protein in response to salt stress have been reported, although salt induced changes in proteins have been shown to be species specific (Flowers and Dalmond, 1992; Fricke, 2004).

CONCLUSION

This study shows that a regulated agronomic management practice and salt application can be employed to improve the processing qualities of tomatoes (Roma VF) fruit. Thus, a local cultivar of tomato such as Roma VF which is adapted to the

Nigerian environment could be enhanced in terms of proximate composition of its fruit using a regulated salt application.

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