The Tomato - Second Most Important Vegetable In The World

The tomato (Lycopersicon esculentum Mill. syn. Solanum lycopersicum L) is second most important vegetable next to potato in the world (Biratu, 2018). Reddy et al., (2013) affirmed tomato as second most essential crop owing to its broader adaptability, high yielding potential and multiuse. Moreover, tomato is an economically important cash crop with higher demand in global market Hannan et al., (2007).Nutritiously, Solanum lycopersicum L is an chief source of minerals (potassium, calcium, phosphorus, iron and zinc), vitamins (vitamin A, B1, B2, B6, biotine, folic acid, nicotinic acid, pantothenic acid, C, E and K), essential amino acids, dietary fibres and sugars (Kanyomeka and Shivute, 2005; Taiana et al., 2015) and it is also an exceptional source of antioxidants and small amounts of vitamin E in daily diets (Rai et al., 2012). Its balanced mixture of minerals, antioxidants and carbohydrates earns an excellent nutritional profile. Despite tomatoes being an important vegetable, both abiotic and biotic stresses hinders the production (Minja et al., 2011). Drought (Pedapati et al., 2013) and flooding (Battilani et al., 2012) are the foremost abiotic stresses that constrain the production as tomato has high water requirements but intolerant to soil compaction and waterlogging. Murshed et al., (2008) ascertains that water deficit have detrimental effects on plant growth and development. Sa´nchez-Rodr?´guez et al., (2010) conveyed that though the crops, when subjected to environmental stress alter their growth, metabolism and production; drought is the most adverse environmental factor affecting growth and productivity of crops. It is identified that drought has a profound impact on agricultural systems, thus the ability of crops to withstand this stress is of great economic significance (Shao et al., 2008).

Drought impacts plant growth in different conducts. Cases in point of the impact of drought in plant growth are as Loggini et al., (1999) stated that under drought conditions shoot biomass significantly decreased in wheat; in potato, dry weight and stem length diminished under water stress (Ierna, and Mauromicale, 2006), and in tomato, shoot weight and total leaf area were lower than well-watered (Tahi et al., 2008). Waterlogging/Flood stress causes a number of physiological and morphological responses in tomatoes as Ezin et al., (2010) reported that the waterlogged soils impede oxygen and nutrient uptake by plant and causes leaf chlorosis and necrosis, which start from mature leaves that gradually make up to young leaves. The inhibition of nitrogen (N) uptake and the subsequent redistribution of nitrogen within the shoot cause premature senescence of leaves and the arrested growth of shoots in flooded plants (Drew and Sisworo, 1977). Duma, (1989) addresses that waterlogged soils occasionally induce the underside of tomato leaves to turn purple as a consequence of phosphorus deficiency. Flood stressed tomatoes were found to momentarily shut their stomata, until adventitious roots are formed as a means to ease the stress (Aloni and Rosenshtein, 1982; Kozlowski, 1984). Consequently, to improve agricultural yield within the earth’s limited resources, it’s indispensable to initiate crops capable of producing high yield when cultivated in stressed environments. In addition, Leonardi and Romano (2004) pleaded that grafting can increase resistance to biotic and abiotic stresses of vegetatively propagated plants.

As confided by Rivard and Louws (2011) grafting is effectively employed to battle FWD, RKN and other diseases. Grafting onto compatible and resistant rootstocks has a greater potential to overcome soil borne diseases including TFWD (Louws et al., 2010; Rivard and Louws, 2011).

Grafting onto vigorous rootstocks also improves growth, yield and quality even in the absence of a disease as a result of resistance or tolerance against abiotic stresses (Rivero et al., 2003; Louws et al., 2010; Schwarz et al., 2010; Rivard and Louws, 2011) such as soil salinity, (Santa Cruz et al., 2002); cold (Gao et al., 2006); heat and drought (Abdelmageed and Gruda 2009); waterlogging, (Black et al., 2003; Yetisir et al., 2006). Moreover, Leonardi and Giuffrida (2006) revealed improvement of nutrient uptake by plants as a result of grafting. It also improve water-use efficiency (Cohen and Naor, 2002), increases the rate of photosynthesis, and anti-oxidant enzyme activities (He et al., 2009), fruit quality (Balliu et al., 2008; Turhan et al., 2011), consequently, grafting increases crop yields under natural growing environment and heavy metal toxicity (Edelstein and Ben Hur, 2006), harvest duration (Lee, 1994) and shelf life (Davis et al., 2008a, b). Graft incompatibility is one of the major challenges especially when rootstocks and scions differ in growth vigour. Therefore, there is limited information on graft success between the selected rootstocks (S. anguivi and S. melongina var. PPL) and selected tomato cultivars (S. lycopersicon var. Roma and Ratan). Plant growth, yield, fruit quality and economic feasibility of the combinations under question are also yet to be explored. However, if fruit quality is poorly affected as an outcome of grafting, farmers may be less likely to take on this technique (Barret, 2011).Therefore, this study is designed to evaluate graft compatibility between the rootstocks and scions under consideration. The study is designed to determine the effect of grafting on plant growth, yield, fruit quality, and to determine whether S. anguivi as an interspecific rootstock can impart flood and drought tolerance of tomato scions.