

## Screening and evaluation of resistance variety of golden sweet potato (*Ipomoea batatas L.*) under water stress

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### Abstract

Pot experiments were used to screen Five Golden sweet potato varieties for drought resistance. Two water regimes were applied, control (maintained by regular watering at or close to field capacity) and water stressed plants (saturated and allowed to dry gradually to permanent wilting point). Plant Dry leaf mass, main stem length, internode length, all decreased in response to the water stress. Leaf water potential reduced dramatically when water supply was cut off, but there was no statistical difference across cultivars in both control and water stressed treatments. The cultivar ST-14 demonstrated more significantly developed drought resistance characteristics than the other cultivars.

**Media summary:** Of Five sweet potato cultivars evaluated, ST-14 showed the greatest drought tolerance.

**Keywords:** Sweet potato (*Ipomoea batatas L.*), drought, ST-14, CIP440127, PRDF-I-10

### Introduction

Sweet potato (*Ipomoea batatas* (L.) Lam) is grown in a wide range of environments and cultural practices and is typically grown in low-input farming systems (Prakash 1994) [3]. The plant is sensitive to water deficit, especially during the growing season, including vine development and stock root formation (Indira and Kabeerathumma 1988) [2]. Sweet potato is considered moderately drought tolerant (Valenzuela et al 2000) [4]. However, drought is often a major environmental constraint to sweet potato production in rainfed regions (Anselmo et al. 1998) [1]. Different cultivars may respond differently to limited amounts of groundwater. Selection of a cultivar with good performance (growth rate; tuber development) under drought conditions is considered very important. Therefore, attempts were made to identify golden sweet potato cultivars associated with drought tolerance.

### Methods

A pot experiment to evaluate drought tolerance of 5 cultivars of Golden sweet potato was conducted in Department of Botany, DDU Gorakhpur University, Gorakhpur. A pot experiment were consisted of water stress treatments and normal water supply for 5 cultivars. Each treatment was replicated 3 times. Fifteen pots were used to determine the amount of water at wilting point, and another Fifteen pots were watered normally. Tip cuttings (25 cm long) of each cultivar were planted after soaking for 2 days in water. The plants were watered to saturation point after which water was permanently withheld in the stress treatment. While water stress was induced gradually by withholding water, the unstressed set of control plants was watered to field capacity every other day. Growth parameters were measured after 2 to 3 week of planting.

### Results and discussions

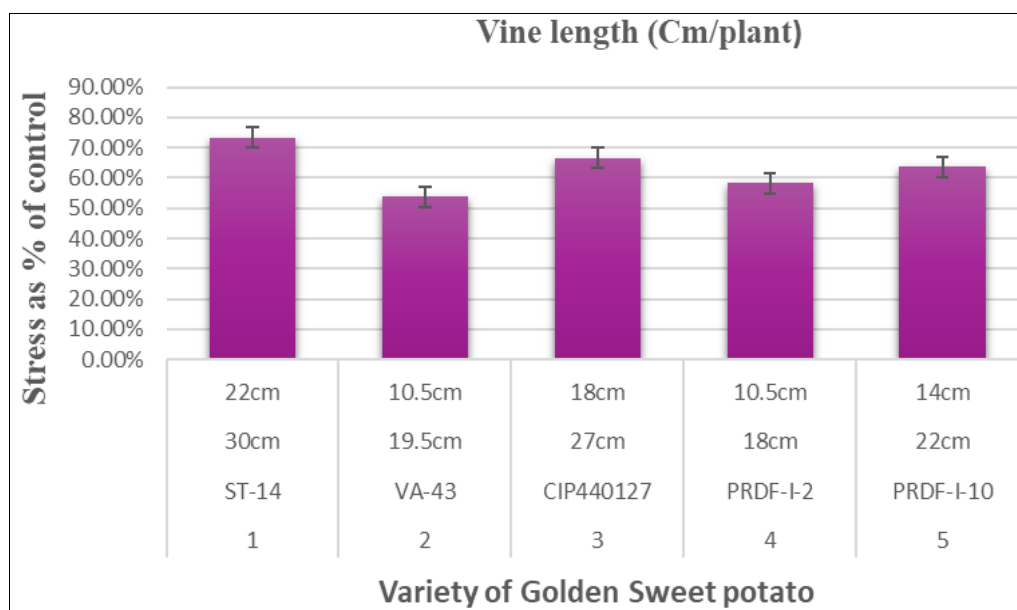


Fig 1: Vine length of some variety of Golden Sweet potato under drought condition

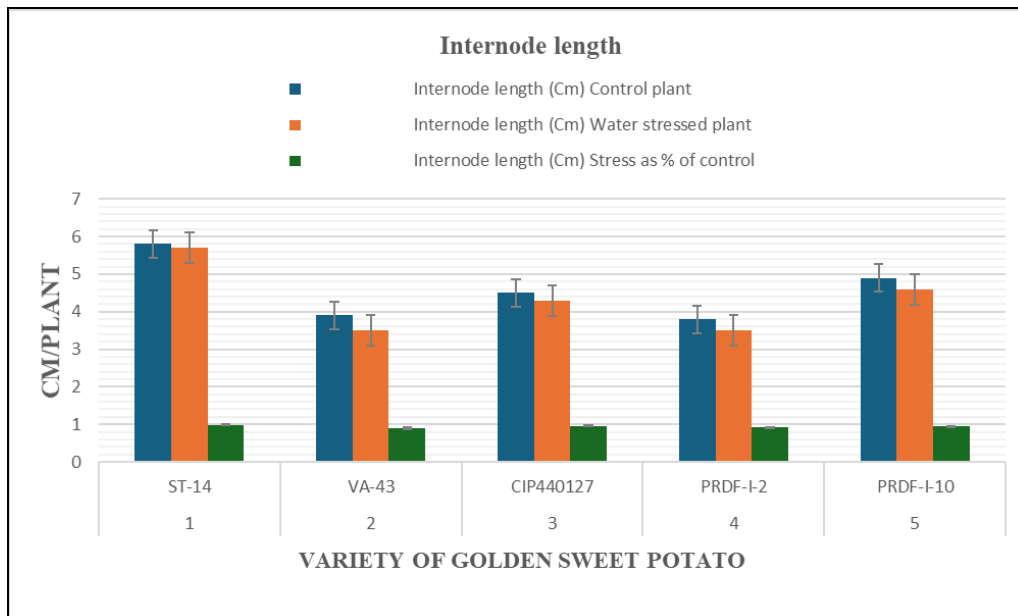


Fig 2: Internode length of some variety of Golden Sweet potato under drought condition

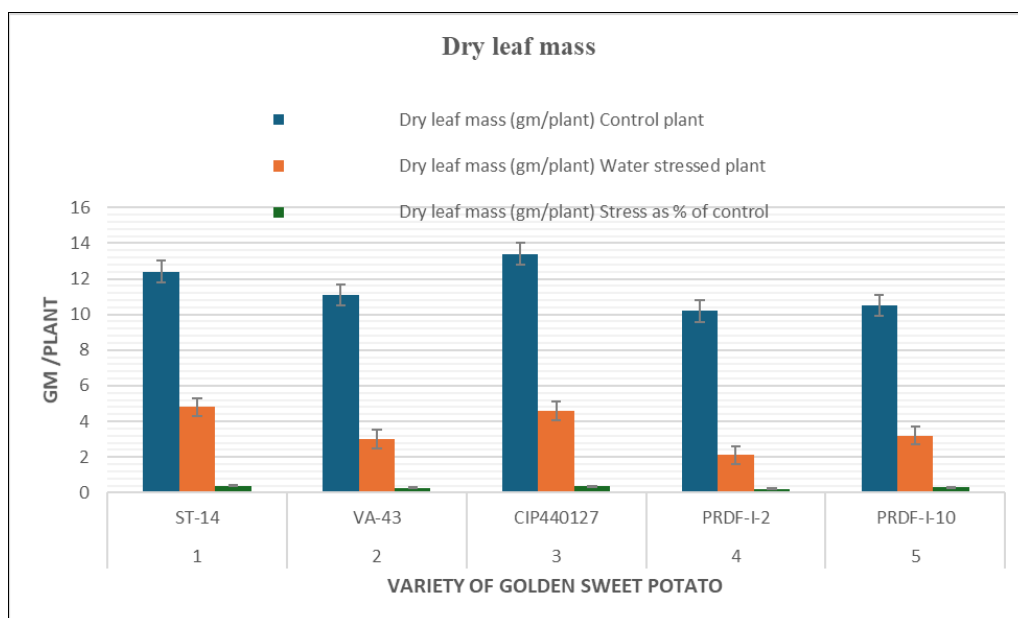


Fig 3

There were significant interactions between water treatments and cultivars for most parameters observed, suggesting that the overall responses of cultivars to water treatments were statistically similar. All cultivars responded significantly to drought by reducing total plant growth, except for internode length.

However, a number of cultivars showed differential growth responses to drought. The length of the main stem in all variety under well-watered and water stressed conditions increased from 2 weeks to 4 weeks after planting. While growth of the stem length under water stress conditions was slower, a significantly greater increase was recorded in stem lengths grown under well-watered conditions. The highest vine length was observed in ST-14 (30cm) which was followed by CIP 440127 (27cm) and PRDF-I-10 (22cm), on the other hand, the lowest vine length was observed in PRDF-I-2(18 cm). It has been observed that genotypes with long vines also produced a large number of leaves. The variety ST-14 with the longest vines, could therefore, be

used as forage for feeding ruminants due to their richness in protein. Vine length differs due to genetic make up present in the genotype as well as tolerance to the acidic soil. Rashid et. al. (2002), Onukaet al. (2012) and yooyongwechet al. (2014) stated that vine length is a genetic character and may differ from genotype to genotype under similar soil and environmental conditions. The growth behaviour of sweet potato may vary in particular climate other than it originated.

Internode length was not affected by the applied soil water stress, but it varied significantly among the cultivars (Fig- 2). The interaction effect between soil water regimes and cultivars however was statistically significant. Under well-watered conditions, ST-14 produced the greatest internode length, followed by PRDF-I-10 and CIP 440127 (Fig- 2). The cultivars with the shortest internode lengths were VA-43. When water was withheld, the internode length of several cultivars declined. The ST-14 cultivar produced the highest internode length under water stress, followed by

CIP440127. However, VA-43 had the greatest percentage of internode length reduction, followed by PRDF-I-2.

Leaf mass declined significantly under the water stress condition (Fig-3). The leaf masses of ST-14 and CIP 440127 were least affected by water stress, and the most affected were PRDF-I-2, VA-43 and PRDF-I-10. The leaf mass data suggest that cultivars ST-14 and CIP 440127 have some drought tolerance, as they were less affected by the water stress compared to their growth under well-watered conditions. On the other hand, the cultivars PRDF-I-2 and VA-43 appear to be sensitive to water stress as their leaf masses were reduced the most by the imposed water stress.

### Conclusion

Drought gradually leads to a decrease in soil water content and affects water relations and growth in all sweet potato varieties. Of the five sweet potato varieties evaluated, ST-14 is considered the most resistant to water stress. Drought tolerance of ST-14 is associated with lowest growth rate, lower water consumption, higher leaf water potential and delayed wilting under drought stress conditions.

### Conflict of interest

The author(s) certify that there is no conflict of interest with any financial\ research /academic organization, with regards to the discussed in the manuscript.

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