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Effect of anti-ethylene and cytokinin biostimulants on flowering and yield of Sweetpotato (*Ipomoea batatas* L.)

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ABSTRACT: Breeding is needed to enhance the poor agronomic and qualitative attributes of the majority of sweetpotato cultivars grown in Nigeria. Even though the majority of cultivars don't often flower, the flowers are essential for genetic advancements. This study aimed to assess the effect of anti-ethylene (Silver-thiosulphate) and cytokinin (6-benzyladenine) biostimulants for induction of flowering and yield, to encourage early flowering of delayed sweetpotato genotype, and to ascertain the ideal concentration of growth regulators for sweetpotato flowering induction. A randomized complete block design with three replications was fitted with a 3x3x2 factorial arrangement. The first factor consisted of three different concentrations of two plant growth regulators (PGR): silver thiosulphate (STS) and 6-benzyladenine (BA) (0, 50, and 100 ppm). Three types of sweet potatoes (Umuspo3, Buttermilk, and Tis87) constituted the second factor. After planting, the BA and STS were administered three weeks later. The sweet potato varieties sprayed with STS and BA displayed morphological and physiological challenges, such as stem drooping (Temporal) (Page 1A), which recovered in 24 hours, root swelling, stem splitting, bud and flower production, vine branching, and elongation (Plate 1B). Varieties sprayed with high concentrations of STS (100 ppm) displayed significant morphological and physiological abnormalities, while those sprayed with BA displayed a significant increase in all growth metrics. However, two of the varieties Umuspo3 and Tis87 that were sprayed with STS and BA began buds and set flowers within two weeks after the treatment, whereas the plants that were not sprayed did not flower at all. The results of the interactions showed that the combination of benzyladenine + Umuspo3 at 100% (100T1V1) was superior for yield, whereas the combination of silver thiosulphate + Umuspo3 at 100% (100T2V1) was superior for the total number of flowers/plant. The vegetative growth parameters and the flowering characteristic exhibited a substantial positive connection ($P<0.05$), however the correlation between the vegetative growth traits and the yield traits was negative. As a result, the higher dosage of BA and STS (100 ppm) that was employed in this experiment is most likely quite near to the ideal concentration for sweet potato flower induction. Despite not being the ideal concentration, sweet potatoes can currently be induced to flower at this level, enabling the start of breeding programs for the crop.

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KEYWORDS: Sweet potato, flowering, induction, anti-ethylene, cytokinin.

1.0 INTRODUCTION

Despite being one of the least advertised tuber crops, sweet potatoes (Ipomoea batatas L.) are a substantial crop in Africa and the Pacific. This is paradoxical because over the past 40 years, the production of this food crop has been increasing rapidly (Spore, 2013). Data that was available indicated that Nigeria is producing more sweet potatoes (Ezeano, 2006). Cultivated in over 100 countries, sweet potatoes are a major food crop worldwide (Wu et al., 2008). The crop has the potential to be a significant source of both carbohydrates and energy (Hill et al., 1992). Furthermore, due to its notable concentration of phytonutrients including β-carotene, anthocyanin (Mohamad-Zahari, 2016), phenolic acids, minerals, vitamins, and dietary fiber (Turner, 2001; Tumuhimbise et al., 2009), orange skinned cultivars have been acknowledged as healthful foods. Due to its advantageous protein composition and

high mineral, vitamin, and antioxidant content, sweet potatoes are thought to be helpful to human health (USDA 2007, Tumwegamire et al., 2011). Sweet potato tubers are used in industry for the extraction of starch as well as the manufacture of yeast, acetic acid, and alcohol (González et al., 1999; Zuraida 2003).

Because of its significance, the nation must start breeding efforts to improve sweet potatoes so they can be used for a variety of purposes. In addition to lacking other desirable qualities including high dry matter content, higher levels of β-carotene, and drought resistance (Mwanga et al., 2007; Gasura et al., 2008; Grüneberg et al., 2009), the majority of landraces are susceptible to the sweetpotato virus disease (Gasura and Mukasa, 2010). Increases in tissue swelling, stem cracking, vine drooping, leaf epinasty, and leaf senescence are caused by increases in endogenous ethylene and abscisic acid. These physiological abnormalities cause a chain reaction of signals that activate further genes involved in the development and blooming of floral organs (Lohmann and Weigel, 2002; Ausín et al., 2005; Tan and Swain, 2006). Temperature and duration of day have the most effects on sweetpotato flowering. Since sweet potatoes have short days, photoperiods of 8 to 11.5 hours of strong light are used to stimulate flowering. Temperatures between 20 and 25 °C and a relative humidity of more than 75% are ideal for flowering and fruit set (Huamán, 1999). The lack of blossoms or the presence of few flowers complicates sweet potato breeding. Certain landraces of sweet potatoes never flower in regular field conditions. Environmental and genetic variables regulate sweet potato flowering and sexual seed production.

As a result, a number of methods have been developed to encourage the flowering and seed set of sweet potatoes. These consist of a brief photoperiod, a moderate temperature, a restricted water supply, vine girdling, overwintering, trellising, controlling nutrition, and using growth regulators. The viability and effectiveness of a method should be considered before selecting it for flower induction. A growth regulator like 2, 4-dichlorophenoxy acetic acid (2, 4-D) has the benefit of being widely applicable to a variety of landraces. 2, 4-D promotes flowering at low concentrations (Grossmann, 2007). It is quickly transported by the symplastic and apoplastic channels, easily penetrating leaves, roots, and stems (Chinalia et al., 2007). It also stimulates excessive manufacture of ethylene and abscisic acid (Chinalia et al., 2007; Grossmann, 2010).

The start of the sweet potato breeding program through artificial hybridization will be aided by the evaluation of growth regulators' effectiveness in floral induction. This will also make it possible to assess genetic diversity using floral features. Consequently, floral induction will let landraces with superior agronomic qualities evolve, making sweet potatoes a crucial crop for the nation's food security. Therefore, the purpose of this study was to assess the effect of anti-ethylene and cytokinin biostimulants for induction of flowering and yield in order to ascertain the ideal concentration of growth regulators for sweetpotato flowering induction.

2.0 MATERIALS AND METHODS

2.1 Experiment Site Description

During the 2018 cropping season, the field experiment was carried out at the Michael Okpara University of Agriculture in Umudike, South Eastern Nigeria. Umudike is located between latitude 50291N and longitude 70331E. It is 122 meters above sea level, with an average annual rainfall of roughly 2200 mm spread throughout the months of March through November, and has an average air temperature of 260 degrees Celsius. It grows on sandy loamy soil with a growing season of 296 days from March to January with an evaporation rate of 1531 mm. (NRCRI, Meteorological Station, Umudike: NRCRI, Meteorological Station, Umudike).

2.2 Sweet Potato Establishment and Management

The National Root Crop Research Institute (NRCRI) in Umudike provided vine cuttings of three sweet potato types (umuspo3, buttermilk, and tis87) as well as plant growth regulators (PGR) called cytokinnin (6-benzyladenine) and silver thiosulphate (STS). The Umuahia Timber Market was the source of the Tween 20, hand sprayer, plastic curtain, hoe, and spade, as well as insecticide.

In three replicates, a 3*3*2 factorial arrangement containing all 18 treatment combinations was fitted into a randomized complete block design (RCBD). Two plant growth regulators (PGR) make up factor A, three application rates make up factor B, and three sweet potato kinds make up factor C. Each of the three types of sweet potatoes was planted in 54 experimental units, or subplots, with a 2.4 m ridge. With an overall experimental area of 18.9 m x 11 m (207.9 m2), an inter- and intra-row spacing of 0.3 m x 1 m was noted. Hoe and spade were used for land clearing, tillage, and creating ridges. One (1) vine per hole at a depth of 0.03 meters, and a total of eight (8) plants/plot, were planted on a ridge height of 0.36 meters using consistent vine cutting of the elite types of sweet potatoes, which are roughly 0.25 meters long.

Weeks following sowing, dead vines were supplied. Weeds were controlled by hand weeding. Six weeks after planting, organic manure was applied as a basal dressing at a rate of 300 kg/ha, followed by a top dressing of ammonium nitrate at a rate of 60 kg/ha utilizing band placement. Stakes made of 2.0 m bamboo were covered in vines. Rain supplied the experimental location.

Three weeks after planting, a hand sprayer was used to apply a foliar spray containing three levels (0, 50, and 100 ppm) of cytokinin (6-benzyladenine), BA, and silver thiosulphate (STS) together with 3.6g of Tween 20 as a surfactant. The application was repeated every three weeks. To stop the drift of silver thiosulphate (STS) and 6-benzyladenine BA (cytokinin), a plastic curtain was employed.

2.3 Data Collection and Analyses

Following spraying, data were collected, and for each treatment (planting month), the number of days from spraying to bud and flower formation was noted. Every day, the number of buds and flowers generated in each plot was tallied; the total number of buds

and flowers was collected over a period of thirty days. Additionally, the following parameters were gathered: Number of leaves/plant, number of branches/plant, number of inflorescence, number of tubers, weight of tuber, and length/plant (cm) of the vine. Genstat software version 14 was used to perform an analysis of variance (ANOVA) on the study data. Using the least significant difference (LSD) at the 5% probability level, the mean separations were used to ascertain the effects of the treatments on the variables that were being examined (obi, 2002).

3.0 RESULTS AND DISCUSSION

3.1 The Result of the Vegetative Growth and Flowering

Vine Length: Table 1 displays the results of the evaluation of the vine length for each of the three sweet potato cultivars. It was noted that the effect of the treatment application on the length of the vine differed significantly ($P<0.05$). Every treatment exhibited a statistically significant effect greater than the control. The Umuspo3 variety, when treated with 100% concentration of Benzyladenine, exhibited the longest vine length (194.8 cm), followed by the Umuspo3 variety treated with 100% concentration of Silver thiosulphate, which displayed the shortest vine length (184.2 cm), while the control variety, butter milk, displayed the shortest vine length (84.6 cm).

Number Branches: Table 1 also displays the outcome of the effects of STS and BA at 0%,50%, and 100% on the number of branches. Regarding the number of branches, a significant difference ($P<0.05$) was found in the treatments applied. With the application of 100% concentration of Benzyladenine on the Buttermilk variety displaying the highest mean number of 6.00 branches, followed by the application of 100% concentration of Benzyladenine on Umuspo3 with a value of 5.59, the treatments demonstrated a more significant effect than the control, while the Tis87 variety for the control showed the least number of branches (2.22).

Number Leaves: The results on Table 1 also showed the number of leaves on each of the three sweet potato varieties. The effect of treatment application on the number of leaves was shown to differ significantly ($P<0.05$), with all treatments exhibiting a greater significant effect than the control. Applying 100% Benzyladenine concentration to the Buttermilk variety resulted in the most leaves (174.1), followed by applying 100% Benzyladenine concentration to Umuspo3 (value: 170.1). The Tis87 variety, used as a control, produced the fewest leaves (71.2).

Vine Diameter: Table 1 again displays the impact of varying concentrations (0%, 50%, and 100%) of BA and STS on vine diameter. The application treatments (0%, 50%, and 100% of BA and STS) had a significant effect ($P<0.05$) on the vine diameter; all treatments had a greater significant effect than the control. The Buttermilk variety, treated with 100% concentration of Silver thiosulphate, produced the largest vine diameter (8.99 mm), followed by Tis87 (8.91 mm), treated with 100% concentration of Benzyladenine. The control variety, Tis87, yielded the lowest vine diameter, measuring 3.81mm.

Number Flowers: On the Table 1, the number of flowers on each of the three types of sweet potatoes was evaluated. A statistically significant variation ($P<0.05$) was noted in the relationship between the quantity of flowering and the treatment application. Every treatment exhibited a more notable impact than both the buttermilk variety and the control. When 100% silver thiosulphate was applied to the Umuspo3 variety, the number of flowers produced was 48.48. When 100% benzyladenine was applied to the Umuspo3 variety, the number of flowers produced was 40.56. When 50% benzyladenine was applied to the Tis87 variety, the number of flowers produced was 19.56.

Leave area index: The same Table 1 also displays the outcome of the impact of STS and BA at0%,50%, and 100% on the Leave area index. The effect of treatment application on the Leave area index indicated a significant difference ($P<0.05$), with all treatments demonstrating a greater significant effect than the control. Applying 100% Benzyladenine concentration to the Tis87 variety resulted in the highest Leave area index of 7.66, followed by applying 100% Benzyladenine concentration to the Umuspo3 variety, which showed a Leave area index of 7.53. The Buttermilk variety, used as a control, displayed the lowest Leave area index of 3.86.

Table 1: The Vegetative Growth Result of the three (3) Sweetpotato varieties Treated with BA and STS at Different Levels of Concentration (ppm) (0%, 50%, and 100%)

Treatment	Vine Length(cm)	Number of Branches	Number of Leaves	Vine Diameter(mm)	Number of Flower	Leave Area Index
0T1V3	93.2	2.41	71.2	4.21	0.00	4.14
0T1V1	97.9	2.59	84.0	4.34	0.00	3.99
0T1V2	92.7	2.33	80.4	4.09	0.00	3.86
0T2V1	99.9	2.44	77.9	4.00	0.00	4.52
0T2V2	84.6	2.56	80.2	4.22	0.00	4.03
0T2V3	91.8	2.22	76.8	3.81	0.00	3.92
100T1V1	194.8	5.59	170.1	8.80	40.56	7.53
100T1V2	139.8	6.00	174.1	8.67	0.00	5.91

100T1V3	177.1	4.67	153.3	8.91	40.33	7.66
100T2V1	184.2	4.22	162.1	8.90	48.48	6.85
100T2V2	122.2	4.70	160.1	8.99	0.00	5.56
100T2V3	174.7	3.93	140.1	8.86	40.22	6.35
50T1V1	170.3	3.59	136.5	6.54	20.85	6.08
50T1V2	109.7	3.85	152.7	7.14	0.00	4.77
50T1V3	169.6	3.52	143.3	6.86	19.56	6.06
50T2V1	167.1	3.33	119.6	6.37	27.67	6.41
50T2V2	116.2	3.89	143.3	6.67	0.00	5.79
50T2V3	157.7	3.59	127.1	6.78	28.41	5.81
FLSD	32.34	2.00	23.36	1.78	9.77	0.84
CV%	25.6	59.0	20.0	29.1	71.0	9.1

Key: **V1**=variety 1 (Umuspo3), **V2**=variety 2 (Buttermilk), and **V3**=variety 3 (Tis87)
T1=treatment 1 (BA), **T2**=treatment 2 (STS) **0, 50, 100**= % treatment concentration (ppm) at different levels

3.2 The Result of the Yield

Number of Tubers: Table 2 displays the impact of varying concentrations (0%, 50%, and 100%) of BA and STS on vine diameter. The effect of applying a treatment on the number of tubers was found to be non-significant ($P<0.05$). All treatments did not demonstrate a greater significant effect than the control, with the Umuspo3 variety showing the highest number of tubers (4.56), followed by the application of 100% concentration of benzyladenine (2.89 numbers of tubers), and the Buttermilk variety showing the lowest number of tubers (0.33).

Tuber Weight: Table 2 also displays the findings of the investigation into the impact of varying concentrations (0%, 50%, and 100%) of BA and STS on the quantity of tubers in three distinct sweet potato cultivars. The effect of the treatment application on the number of tubers was found to be non-significantly different ($P<0.05$), meaning that none of the treatments had a greater significant effect than the control. The Umuspo3 variety for the control had the highest number of tubers, weighing 848g, followed by the Umuspo3 variety for the control weighing 2.89g, and the Buttermilk variety for the control weighed the least, weighing 98g.

Table 2: The Yield Result of the three (3) Sweetpotato varieties Treated with BA and STS at Different Levels of Concentration (ppm) (0%, 50%, and 100%)

Treatment	Number of Tuber	Tuber Weight (g)
01T1V3	2.00	509.35
0T1V1	4.56	848.25
0T1V2	0.56	144.27
0T2V1	2.44	810.07
0T2V2	0.33	98.09
0T2V3	1.22	294.16
100T1V1	2.89	744.28
100T1V2	0.67	79.31
100T1V3	1.56	332.34
100T2V1	1.56	468.05
100T2V2	0.56	157.03
100T2V3	1.00	139.17
50T1V1	1.56	532.25
50T1V2	1.11	138.21
50T1V3	0.89	338.31
50T2V1	2.22	458.11
50T2V2	1.44	158.20
50T2V3	1.11	303.08
FLSD	1.76	475.43
CV%	68.85	78.85

Key: **V1**=variety 1 (Umuspo3), **V2**=variety 2 (Buttermilk), and **V3**=variety 3 (Tis87), **T1**=treatment 1 (BA), **T2**=treatment 2 (STS). **0, 50, 100**= % treatment concentration (ppm) at different levels

3.3 Correlation Analysis of the Flowering, Vegetative Growth and Yield Characteristics.

The correlation study of floral, vegetative growth, and yield characteristics was displayed in Table 3. The findings indicated a negative link between the vegetative growth traits and yield attributes, but a positive and substantial ($P<0.05$) correlation between the vegetative growth parameters and the flowering trait. This suggested that the yield would decrease with increasing vegetative growth traits. The number of branches exhibited a non-significant and negative link with root weight, but a positive and very significant correlation with the number of leaves (0.76**), vine length (0.72**), vine diameter (0.85***), and flowers (0.46*).

The number of flowers (0.53*), vine length (0.72**), vine diameter (0.87***), and leaf area index connection with tuber count (-0.15) and root weight (-0.18) were all positively and significantly correlated with the number of leaves. The number of flowers (0.8***), the leaf area index (0.79**), and the vine length and vine diameter (0.82***) all showed a positive and substantial correlation.

Vine diameter exhibited a negative but non-significant correlation with the number of tubers (-0.09) and root weight (-0.11), and a positive and significant correlation with the number of flowers (0.65**) and the leaf area index (0.8***).

The leaf area index and flower count were positively and significantly correlated (0.79**). A noteworthy and affirmative association was discovered between the quantity of tubers and the weight of the roots.

Table 3: Correlation Analysis of the Flowering, Vegetative Growth and Yield Characteristics.

	Number of Branches/plot	Number of Leaves/plot	Vine Length	Vine Diameter	Number of flowers/plot	Leaf area index	Number of tubers	Root Weight
Number of Branches	-							
Number of Leaves	0.76**	-						
Vine Length	0.72**	0.72**	-					
Vine Diameter	0.85***	0.87***	0.82***	-				
Number of flowers	0.46*	0.53*	0.83***	0.65**	-			
Leaf area index	0.23	0.62**	0.79**	0.80***	0.79**	-		
Number of tubers	0.02	-0.15	0.12	-0.09	0.07	0.04	-	
Root Weight	-0.05	-0.18	0.13	-0.11	0.13	0.09	0.88***	-

*, ** and *** means significance at 0.05, 0.01, 0.001 probability level respectively.

Plate 1: showing healthy Sweet potato (A) 1st foliar spray after staking at 3rd week and (B) 2nd foliar spray at 4th week

Plate 2: showing healthy Sweet potato, foliar sprayed at 5th week

Plate 3: showing healthy Sweet potato Flower bud formation, stem splitting (A) and flowers (B) at 3rd week after first foliar spray (100%)

Plate 4: showing healthy Sweet potato with (C) Root swelling, (D) Vine branching and Elongation at 3rd week after first foliar spray (100%)

Plate 5: showing control with no flower initiation

Plate 6: showing healthy Sweet potato with much flower at 5th week of foliar spray at 50 and 100%

Plate 7: showing Yield for Treatment at 50

Plate 8: Showing Yield for Treatment at 100%

DISCUSSION

Sweet potato underwent a variety of morphological and physiological changes following the application of silver thiosulphate and benzyladenine. These included temporal stem drooping (plate 4 A&B), which recovered in 24 hours, root swelling and stem splitting (plate 3 A&B), bud and flower formation, vine branching, and elongation. When comparing plots that received a high dose of silver thiosulphate (100 ppm) to those that received a smaller dose (50 ppm), it was found that these morphological and physiological problems were more widespread in the former. According to Grossmann, 2010 article, the morphological and physiological abnormalities seen following the administration of silver thiosulphate and benzoladenine were typical of the ethylene and abscisic acid signaling pathways. According to Wada and Takeno (2010), stress brought on by these aberrant hormone levels stimulates transcriptional factors, which in turn causes blooming. Consequently, rather than being considered an unwanted symptom, morphological and physiological abnormalities seen after spraying with silver thiosulphate and benzyladenine should be recognized as an important step towards the floral induction. No morphological or physiological alterations were noted in the plants that were not sprayed (0 ppm). Untreated sweet potato plants did not initiate buds or flowered when sprayed with silver thiosulphate and benzoladenine (0 ppm). However, the treated Buttermilk variety did not blossom but did exhibit morphological and physiological changes.

The application of Benzyladenine at a concentration of 100 ppm had the highest stimulatory effect on plant growth and development, while Silver thiosulphate and Benzyladenine improve lateral buds, cell elongation, cell division, and vegetative growth, which in turn increase the number of leaves, vine length, number of branches, and vine diameter per plant. A number of developmental programs in plant development are influenced by cytokinins, also known as benzyladenine. These programs include apical

dominance, nutrient uptake, phyllotaxis, shoot initiation and growth, gametophyte, embryonic development, leaf senescence, and vascular and plant responses to biotic and abiotic factors (Kieber and Schaller 2002). The outcomes agree with Mahesh and Sen's (2005) research on okra. Brumbaugh (2008) noted similar outcomes with peas, and Avinash et al. (2011) noted similar outcomes with okra. Better carbon assimilation and better carbon buildup of carbohydrates in the plants may be responsible for the high yield, while rapid cell division and multiplication may be the cause of the rise in vegetative characteristics. Vijay Kumar and Ray (2000) observed similar outcomes in cauliflower, and Banerjee and Das (1984) in potatoes.

While the Buttermilk variety did not blossom following the treatment of Silver thiosulphate and Benzyladenine (0, 50, or 100 ppm), it did exhibit morphological and physiological changes, sweet potato plants that were not treated with these substances neither initiated buds nor flowered. The fact that there were non-significant differences between the treatments using different ratios of benzoladenine and silver thiosulphate may indicate that the amounts used were higher than ideal, which prevented a distinct pattern from emerging.

Two kinds, Umuspo3 and Tis87, that were sprayed with 50 and 100 ppm of silver thiosulphate and benzoladenine, showed buds and regular flowers. But after the initial spraying, which occurred three weeks after planting, the Umuspo3 variety was the first to flower, followed by Tis87 after two weeks. Umuspo3 stood out from the others with a comparatively high number of buds and flowers and a significant difference ($p<0.05$).

When 100% concentration of silver thiosulphate was applied to the Umuspo3 variety, the number of flowers produced was 48.48. When 100% concentration of benzyladenine was applied to the Umuspo3 variety, the number of flowers produced was 40.56. When 50% concentration of benzyladenine was applied to the Tis87 variety, the number of flowers produced was 19.56. Prior research has demonstrated that the application of STS as a whole plant foliar spray enhances cassava flowering (Hyde, et al., 2016). Silver thiosulfate has been frequently utilized as a plant growth regulator (PGR) to extend the vase life of several plant species during the past few decades (Serek et al., 2006). Ricard et al. (1990) reported similar outcomes of an increase in flower number by treatment of 2,4-D.

The findings show that in two of the three sweet potato varieties under investigation, flowering can be effectively induced by silver thiosulphate and benzyladenine. This demonstrated that both internal and exterior influences affect flower induction (Ausín et al., 2005).

Since level two (50 ppm) allows for the use of lesser quantities of benzoladenine and silver thiosulphate while still producing a comparable number of buds and flowers to those produced with greater concentrations, it is almost the ideal level for inducing flowers. As a result, using 50 ppm is not only inexpensive but also lessens the amount of foliar damage, as was shown to happen at greater concentrations of benzyladenine (100 ppm) and silver thiosulphate.

Benzyladenine was able to cause flowering, particularly when used at a low dosage (50 ppm). Our research, however, indicated that the ideal concentration for applying benzyladenine and silver thiosulphate to sweet potatoes was approximately 100 ppm. The outcome is consistent with the findings of Sujatha et al. (2002) and Karaguzel et al. (1999), who reported that different growth regulators at varying levels enhanced the number of blooms per plant. Variations in dose may be caused by differences in the quantity of each variety's foliage; a variety with a large amount of foliage biomass will need a higher dosage than one with a small amount. The interactions with the highest yield were determined to be Benzyladenine + Umuspo3 at 100% (100T1V1) and Silver thiosulphate + Umuspo3 at 100% (100T2V1).

Based on yield, the findings indicated that an increase in branch production results in an increase in leaf production, vine length, vine diameter, and flower output. An increase in branch production also leads to a decrease in root weight. While the number of tubers and root weight reduces as the number of leaves grows, other variables such as vine length, vine diameter, number of flowers, and leaf area index also rise with the number of leaves. This is consistent with the earlier research of Olorunnisomo (2007), who found that while root yield decreased with delayed cutting, forage output increased. Greater vine length, more flowers, and a higher leaf area index were the results of vine elongation. The number of blooms and leaf area index increased as vine diameter increased. The leaf area index increased with the number of flowers, but the root weight increased with the number of tubers. The biomass yields of sweet potatoes' roots and vines are high (An et al., 2003). Root weight reduces with increasing branch count, leaf count, and vine diameter, whereas the number of tubers decreases as these factors grow. This contradicts the claim made by An et al. (2003) that sweet potatoes have large biomass yields for both roots and vines, and it is consistent with previous research by Olorunnisomo (2007) that showed decreased root production and higher forage yield with delayed cutting.

CONCLUSION

The findings demonstrated that when administered foliar at 100 ppm, silver thiosulphate and benzoladenine can successfully trigger sweet potato blooming. Two of the varieties Umuspo3 and Tis87 that were sprayed with BA and STS began buds and set flowers within two weeks of spraying, at three weeks after planting, while the plants that were not sprayed did not flower at all.

It is possible to draw the conclusion that silver thiosulphate is superior for flower characteristics, while benzoladenine is superior for vegetative characteristics and yield. Among PGR concentrations, 100% Benzyladenine has increased vegetative and yield,

whereas 50% and 100% Silver thiosulphate and Benzyladenine have improved flower characteristics. The results of the interactions showed that the combination of benzyladenine + Umuspo3 at 100% (100T1V1) was superior for yield, whereas the combination of silver thiosulphate + Umuspo3 at 100% (100T2V1) was superior for the total number of flowers/plant.

Creating floral induction techniques based on benzyladenine and silver thiosulphate is a crucial first step in launching a program to improve sweet potato crops. Sweet potato hybridization will be possible because to an efficient technique of bloom induction discovered in this work that uses foliar sprays containing benzoladenine and silver thiosulphate. Specific gene combinations are guaranteed to be created by controlled pollination. Well-managed hybridization of sweet potatoes can lead to increased dry matter content, vitamin A content, and resistance to pests, diseases, and drought. In the end, this will result in higher sweet potato production nationwide per unit area.

RECOMMENDATIONS

The precise ideal concentration of benzyladenine and silver thiosulphate that can trigger sweet potato flowering needs to be determined by more research. It also needs to be examined how different varieties, temperatures, day lengths, ratoons, and the split application of benzyladenine and silver thiosulphate affect this process.

As a result, the higher dosage of BA and STS (100 ppm) that was employed in this investigation is most likely quite near to the ideal concentration for sweet potato flower induction. Despite not being the ideal concentration, sweet potatoes can currently be induced to flower at this level, enabling the start of breeding programs for the crop.

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