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GROWTH RESPONSE OF SUGARCANE BUD SET (Saccharum officinarum L) AT SEVERAL AGES OF PLANTING MATERIALS AND CONCENTRATIONS OF IBA

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Abstract

The research purpose to decide the growth response bud set cane against IBA concentrations at some planting materials. Research conducted at the field of the Faculty of Agriculture USU, started from May to August used a factorial randomized block design with two factors ei ages of planting material(6,7,8 months) and concentration of growth regulators IBA (100,200,300 ppm). The parameters were the percentage of seedlings grow, the rate of germination, plant length, sum of leaf, diameter, total of tillers, total leaf area, root volume, root length and shoot dry weight. The results showed that the germination rate against age had significant effect by planting material and concentration of growth regulators. The interaction between the ages of planting materials and concentration of growth regulators had not significantly effect on all parameters.

Keywords: bud set, IBA, age of planting material

1. Introduction

Sugar cane is a sugar-producing plant which is a source of carbohydrates. This plant is needed so that it continues to increase along with the increase in population. According to Puri, et al (2013) in 2015 national sugar consumption was 2.72 million tons or an increase of 3.65% compared to 2014 of 2.63 million tons with the land area used throughout Indonesia in 2014 and 2015 amounted to 477,881 Ha and 487,095 Ha. However, the increase in sugar consumption has not been matched by domestic sugar production. This is proven in 2014 sugar production only reached 2,575,390 tons (BPS, 2015).

One of the causes of the low domestic sugar production can be seen from the on-farm side, including the preparation of seeds and the quality of sugarcane seedlings. Seed preparation carried out by the conventional method (mule) greatly affects the seeding time because it takes 7 months for one planting period (Putri , et al., 2013). Meanwhile, according to Solikhah and Imam (2015) the conventional method has several weaknesses, namely the time required for seeding is longer, and requires a large nursery area and the seeds produced are relatively non-uniform.

However, the development of the bud chip was not as expected because its growth was not optimal. Based on the research of Irda (2015) stated that one of the obstacles to sugarcane seeding with the bud chip method is the non-uniform and rather slow growth of roots and shoots on the bud chip originating from the center of the stem and the growth of the

seedlings is still small. Hence the development of bud chips is less desirable than bud sets. This is because bud sets tend to be easier to grow because they still have larger food reserves than bud chips.

The problem that exists in vegetatively propagation of plants is the difficulty of root formation and efforts to accelerate the formation of roots can be done by using growth regulators. Plant growth regulators are organic compounds that are not nutrients, which in small amounts can support, inhibit and can change the physiological processes of plants. To get good seed propagation results, in addition to paying attention to the growth media, growth regulators (ZPT) are needed to support growth and development. Auxin is a hormone that can affect root formation, shoot development, meristem cell activity, flower formation, fruit formation and the fall of leaves and fruit (Sumardi, et al., 2014).

Auxin types of growth regulators commonly used include NAA, IBA and IAA. From Irda's research (2015) it is known that the best growth of sugarcane chip buds is in the administration of IAA with a concentration of 200ppm. However, of the three types of auxin PGR, IBA was the most effective. According to Wudianto (1993) that IBA has better and more effective characteristics than IAA and NAA. Thus, IBA is most suitable for stimulating root activity, because its chemical content is more stable and its working power lasts longer. The provision of IBA ZPT increased the percentage of gofasa stem cuttings (Vitex cofassus Reinw), where the average percentage of rooted cuttings reached 85 percent. ZPT IBA produces longer roots but does not increase the number of roots from stem cuttings (Irwanto, 2003).

2. Materials and Methods

This research was conducted in the research area of the Faculty of Agriculture, University of North Sumatra, Medan. At an altitude of ± 25 meters above sea level, from May to August 2016.

The materials used were sugarcane bud set of BZ 134 variety, top soil, sand as a mixture of planting media, polybag as a planting container, IBA as a growth stimulant, water for treatment to dissolve IBA and other supporting materials. The tools used were hoe to stir the planting media, cutting table, machete, ruler to measure height, measuring cup to calculate volume, caliper to measure plant diameter, oven to dry plants, scales to weigh plants, paper to print plant leaves in measuring leaf area and other supporting tools.

This study used a factorial randomized block design (RAK) with 2 factors. The data were analyzed by means of variance, the real treatment was continued by using Duncan's Multiple Distance Test with a level of = 5% (Steel and Torrie, 1995).

3. Results and Discussion

Germination percentage of seeds

The percentage of bud set seed germination data and its variance showed that the treatment treatment for the age of planting material was significantly different, while the IBA concentration treatment and the interaction of the two had no significant effect on the percentage of bud set germination. see Table 1 below.

Table 1. Percentage of germination of sugarcane bud set seeds at various ages of planting material and IBA concentration

Age of Planting Material	IBA Concentration(ppm)				
	A0 (0)	A1 (100)	A2 (200)	A3 (300)	Average
……..%……					
U1 :6 Months	90.67	94.00	95.33	90.67	92.67 a
U2 :7 Months	87.33	89.33	88.67	86.67	88.00 a
U3 :8 Months	66.00	76.67	66.67	66.67	69.00 b
Average	81.33	86.67	83.56	81.33	83.22

Description: Numbers followed by the same notation in the same column show different not significant according to Duncan's Multiple Distance Test at 5% level

Table 1 shows that the highest percentage of seedling germination was obtained from the use of plant seeds aged 6 months (U1) which was not significantly different from 7 months (U2) but significantly different from 8 months (U3). The highest percentage of seed germination was obtained at the use of IBA 100 ppm (A1) which was not significantly different from other concentrations.

Seed germination rate

The data on the germination rate of bud set seeds and their variance showed that the treatment with the age of planting material and the concentration of IBA had a significant effect, but the interaction between the two had no significant effect on the rate of bud set germination. Seedling germination rates at various ages of planting material and IBA concentrations can be seen in Table 2 below.

Table 2. Seedling germination rate at various ages of planting material and concentration of IBA

Age of Planting Material	IBA Concentration (ppm)				
	A0 (0)	A1 (100)	A2 (200)	A3 (300)	Average
……..day……...					
U1 :6 Months	4.44	5.07	5.49	4.85	4.96 a
U2 :7 Months	4.23	5.19	4.75	4.86	4.76 b
U3 :8 Months	8.59	11.50	9.79	10.75	10.16 c
Average	5.75 a	7.25 b	6.68 b	6.82 b	6.63

Description: Numbers followed by the same notation in the same column and row indicate Not significantly different according to Duncan's Multiple Distance Test at 5% level

Table 2 shows the fastest seedling germination rate was obtained at the use of plant seeds aged 6 months (U1) which were significantly different from 7 months (U2), and 8 months (U3). The fastest seed germination rate was obtained at the use of IBA 0 ppm (A0) which was significantly different from other concentrations, while the concentration of IBA 100 ppm (A1) was not significantly different from the concentration of IBA 200 ppm (A2) and IBA 300 ppm (A3).

Seed length

The data on the length of the bud set seeds and the variance of the treatment of the age of the planting material were significantly different at 2-7 WAP and not significantly different at 8 WAP, while the IBA concentration treatment and the interaction of the two had no significant effect on the length of the bud set seedlings. 8 MST at various ages of planting material and IBA concentrations can be seen in Table 3 below.

Table 3. Seedling length 2-8 WAP at several ages of planting material and concentration of IBA

Age Plant (MST)	Age Ingredient plant	IBA Concentration (ppm)				
		A0 (0)	A1 (100)	A2 (200)	A3 (300)	Average
		……cm……..				
2	U1 :6 Months	31.67	29.47	32.07	32.47	31.42 a
	U2 :7 Months	31.13	29.93	32.07	31.07	31.05 a
	U3 :8 Months	21.53	20.20	23.33	23.27	22.08 b
	Average	28.11	26.53	29.16	28.93	28.18
3	U1 :6 Months	53.67	50.07	56.07	54.67	53.62 a
	U2 :7 Months	49.53	50.47	54.20	55.33	52.38 a
	U3 :8 Months	41.00	39.27	43.07	42.67	41.50 b
	Average	48.07	46.60	51.11	50.89	49.17
4	U1 :6 Months	72.07	67.60	71.67	74.40	71.43 a
	U2 :7 Months	68.47	68.47	73.07	71.13	70.28 a
	U3 :8 Months	54.40	53.53	58.40	56.60	55.73 b
	Average	64.98	63.20	67.71	67.38	65.82
5	U1 :6 Months	75.80	76.13	77.27	80.33	77.38 a
	U2 :7 Months	77.53	76.53	77.40	79.07	77.63 a
	U3 :8 Months	60.87	61.27	67.33	64.40	63.47 b
	Average	71.40	71.31	74.00	74.60	72.83
6	U1 :6 Months	87.13	89.00	92.80	93.53	90.62 a
	U2 :7 Months	87.73	93.07	94.27	92.73	91.95 a
	U3 :8 Months	79.40	78.87	81.87	80.67	80.20 b
	Average	84.76	86.98	89.64	88.98	87.59

Age Plant (MST)	Age Ingredient plant	IBA Concentration (ppm) A0 (0)	A1 (100)	A2 (200)	A3 (300)	Average
7	U1 :6 Months	102.67	101.93	108.87	109.80	105.82 a
	U2 :7 Months	102.67	108.27	107.67	107.73	106.58 a
	U3 :8 Months	94.93	96.93	95.80	96.20	95.97 b
	Average	100.09	102.38	104.11	104.58	102.79
8	U1 :6 Months	127.60	117.73	136.73	127.13	127.30
	U2 :7 Months	118.33	132.07	143.33	132.67	131.60
	U3 :8 Months	121.73	125.47	117.47	121.80	121.62
	Average	122.56	125.09	132.51	127.20	126.84

Description: Numbers followed by the same notation in the same row or group of columns showed no significant difference according to Duncan's Multiple Distance Test at the level of =5%

Table 3 shows that at the age of 2-4 WAP the longest seedlings were obtained when using 6 months (U1) seeds, which were not significantly different from 7 months (U2), but significantly different from 8 months (U3). At the age of 5-7 WAP, the longest seeds were obtained at the age of 7 months of planting material (U2) which was not significantly different from the age of 6 months (U1) but significantly different from the age of 8 months (U3), while at the age of 8 WAP the longest seeds were obtained. in the 7-month treatment (U2) which was not significantly different from the other treatments.

Number of seed leaves

The data on the number of leaves of the bud set seeds and their variance showed that the treatment treatment for the age of planting material was significantly different at 2-4 WAP and not significantly different at 5-8 WAP, while the IBA concentration treatment and the interaction of the two had no significant effect on the number of leaves of the bud set seedlings. Sugarcane bud set leaves 2-8 WAP at several ages of planting material and IBA concentrations can be seen in Table 4 below.

Table 4. Number of seedling leaves 2-8 WAP at several ages of planting material and concentration of IBA

Age Plant (MST)	Age Ingredient plant	IBA Concentration (ppm) A0 (0)	A1 (100)	A2 (200)	A3 (300)	Average
		……sheet……..				
2	U1 :6 Months	1.87	1.40	1.53	1.93	1.68 a
	U2 :7 Months	1.67	1.93	1.67	1.60	1.72 a
	U3 :8 Months	1.07	0.80	1.07	1.07	1.00 b
	Average	1.53	1.38	1.42	1.53	1.47
3	U1 :6 Months	3.07	3.40	2.87	3.47	3.20 a
	U2 :7	3.33	3.40	3.07	3.40	3.30 a

Age Plant (MST)	Age Ingredient plant	IBA Concentration (ppm) A0 (0)	A1 (100)	A2 (200)	A3 (300)	Average
	Months U3 :8 Months	2.73	2.73	3.00	2.87	2.83 b
	Average	3.04	3.18	2.98	3.24	3.11
4	U1 :6 Months	3.93	4.13	3.87	4.13	4.02 a
	U2 :7 Months	3.87	4.27	3.80	3.87	3.95 a
	U3 :8 Months	3.60	3.67	3.87	3.67	3.70 b
	Average	3.80	4.02	3.84	3.89	3.89
5	U1 :6 Months	4.27	4.80	4.33	4.53	4.48
	U2 :7 Months	4.27	4.53	4.20	4.40	4.35
	U3 :8 Months	4.53	4.27	4.73	4.60	4.53
	Average	4.36	4.53	4.42	4.51	4.46
6	U1 :6 Months	5.00	5.60	5.00	5.47	5.27
	U2 :7 Months	5.20	5.47	5.20	5.47	5.33
	U3 :8 Months	5.33	5.40	5.47	5.73	5.48
	Average	5.18	5.49	5.22	5.56	5.36
7	U1 :6 Months	5.87	6.53	6.07	6.47	6.23
	U2 :7 Months	6.13	6.47	6.27	6.53	6.35
	U3 :8 Months	6.27	6.53	6.73	6.67	6.55
	Average	6.09	6.51	6.36	6.56	6.38
8	U1 :6 Months	7.20	7.40	7.53	7.53	7.42
	U2 :7 Months	7.20	7.40	7.60	7.27	7.37
	U3 :8 Months	7.60	7.47	7.33	7.53	7.48
	Average	7.33	7.42	7.49	7.44	7.42

Description: Numbers followed by the same notation in the same row or group of columns showed no significant difference according to Duncan's Multiple Distance Test at the level of =5%

Table 4 shows that at the age of 2-4 WAP the highest number of seedling leaves was obtained from the use of plant seeds aged 7 months (U2) which was not significantly different from 6 months (U1), but significantly different from 8 months (U3). At the age of 5-8 WAP, the highest number of seedling leaves tended to be obtained at the age of 8 months of planting material (U3) which was not significantly different from those of 6 months (U1) and 7 months (U2). The highest number of seedling leaves tended to be obtained at the use of 300 ppm IBA (A3) which was not significantly different from other concentrations.

Seedling diameter

The diameter data of bud set seeds and their variance showed that the age of planting material was not significantly different at 2-8 WAP, while the concentration of IBA had a significant effect on the diameter of the bud set 3 WAP, but had no significant effect on the diameter of the bud set 2 WAP, 4-8. MST and their interaction had no significant effect on the diameter of bud set seedlings.

Table 5. Seedling diameter 2-8 WAP at several ages of planting material and concentration of IBA

Age Plant (MST)	Age Ingredient plant	IBA Concentration (ppm)				
		A0 (0)	A1 (100)	A2 (200)	A3 (300)	Average
		……mm……..				
2	U1 :6 Months	3.41	3.19	3.65	3.59	3.46
	U2 :7 Months	3.43	3.61	3.87	3.49	3.60
	U3 :8 Months	2.89	3.15	3.44	3.50	3.25
	Average	3.25	3.32	3.65	3.53	3.44
3	U1 :6 Months	4.26	4.20	4.56	4.50	4.38
	U2 :7 Months	4.12	4.68	4.72	4.30	4.45
	U3 :8 Months	3.92	4.34	4.3 6	4.72	4.34
	Average	4.10 a	4.41 b	4.55 ab	4.51 b	4.39
4	U1 :6 Months	5.55	5.59	5.73	5.79	5.66
	U2 :7 Months	5.20	5.71	5.87	5.68	5.61
	U3 :8 Months	5.12	5.27	5.62	5.81	5.45
	Average	5.29	5.52	5.74	5.76	5.58
5	U1 :6 Months	6.03	6.27	6.08	6.16	6.13
	U2 :7 Months	5.96	6.09	6.11	6.16	6.08
	U3 :8 Months	5.64	5.90	6.30	6.34	6.04
	Average	5.88	6.09	6.16	6.22	6.09
6	U1 :6 Months	7.01	6.79	7.03	7.19	7.01
	U2 :7 Months	6.86	6.87	7.28	7.11	7.03
	U3 :8 Months	6.59	7.02	6.99	7.04	6.91
	Average	6.82	6.89	7.10	7.11	6.98
7	U1 :6 Months	8.02	7.29	8.21	7.96	7.87
	U2 :7 Months	7.71	7.92	8.34	8.07	8.01
	U3 :8 Months	7.23	7.89	7.78	7.85	7.69
	Average	7.65	7.70	8.11	7.96	7.86
	U1 :6 Months	9.53	8.78	9.53	8.55	9.10

Age Plant (MST)	Age Ingredient plant	IBA Concentration (ppm) A0 (0)	A1 (100)	A2 (200)	A3 (300)	Average
8	U2 :7 Months	8.36	9.17	9.80	8.99	9.08
	U3 :8 Months	8.40	9.04	8.89	8.96	8.82
	Average	8.7 6	7.42	9.41	8.83	9.00

Description: Numbers followed by the same notation in the same row or group of columns showed no significant difference according to Duncan's Multiple Distance Test at the level of =5%

Table 5 shows that at the age of 2-8 WAP, the highest seedling diameter was obtained from the use of plant seeds aged 7 months (U2) but it was not significantly different from other treatments. The highest seedling diameter tends to be obtained at the use of IBA 200 ppm (A2) which is not significantly different from other concentrations

Number of tillers

Data on the number of bud set tillers and the variance of treatment with the age of planting material, treatment with IBA concentration and the interaction of the two had no significant effect on the number of bud set seedlings. 6 below.

Table 6. Number of tillers at various ages of planting material and concentration of IBA

Age of Planting Material	IBA Concentration (ppm) A0 (0)	A1 (100)	A2 (200)	A3 (300)	Average
……..kids……..					
U1 :6 Months	0.86	0.71	0.92	0.50	0.75
U2 :7 Months	0.71	0.92	0.80	0.80	0.81
U3 :8 Months	1.06	1.01	1.04	0.97	1.02
Average	0.88	0.88	0.92	0.76	0.86

Description: Numbers followed by the same notation in the same row or group of columns showed no significant difference according to Duncan's Multiple Distance Test at the level of =5%

Table 6 shows that the highest number of tillers was obtained at 8 months (U3) which was not significantly different from 6 months (U1) and 7 months (U2). The highest number of tillers was obtained with the use of IBA 200 ppm (A2) which was not significantly different from other concentrations.

4. Conclusion

The age of the planting material was significantly different from the percentage of germinating seeds, the rate of seedling germination, and the length of the seedlings with the best growth using a 6 month bud set seedling age. The germination rate was significantly better without IBA administration. The interaction of planting material age and IBA concentration had no significant effect on all parameters.

5. Reference

Putri, A. D., Sudiarso dan T. Islami. 2013. Pengaruh Komposisi Media TanamPada Teknik Bud Chip Tiga Varietas Tebu (Saccharum officinarum L.). Jurnal Produksi Tanaman 1(1).Universitas Brawijaya. Malang.Hal.1-2.

Sholikhah, Ummi., Imam. 2015. Kelompok Petani Tebu Rakyat di Kecamatan Semboro Kabupaten Jember.Jurnal Inovasi dan Kewirausahaan Vol.4 Hal.47-54

Irda, Meiriani dan Yaya. 2014. Keragaan Bibit Bud Chip Tebu (Sacharum officinarum L.) dengan Perlakuan Lama Perendaman dan Konsentrasi IAA. Jurnal Online Agroekoteknologi. Vol 3.No.2 :489-498.

Sumardi., I. Umarie., dan I. Wijaya, 2014. Respon Pertumbuhan Bibit Tebu Single Bud Planting Terhadap Pemberian Auxin dan Urea. Universitas Muhammadiah Jember.

Indrawanto, Chandra. ,Purwono ,Siswanto, M.Syakir., Widi Rukmini. 2010.Budidaya dan Pasca Panen Tebu.Eka Media, Jakarta.Hal.1-10.