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Research Paper

Varying frequency application of alpha-naphthalene acetic acid (NAA) on the growth and yield of Setaria (*Setaria sphacelata*) under Surigao Del Sur condition

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African pigeon grass or setaria grass, is native to tropical and subtropical Africa. It is cultivated as pasture grass and fodder crop. It is a good source of quality feed and suitable for cut-and-carry. The application of synthetic auxin plant hormone that is used for vegetative propagation of plants from stem and leaf cuttings. This study was conducted to determine the effects of using various frequency application of NAA in setaria production; and To evaluate the growth and yield of setaria using various frequency application of NAA. The experiment was laid-out in Complete Randomized Design (CRD) with four treatments replicated three times. The treatments were: T1- Untreated, T2- weekly application, T3- bi-weekly application and T4-Monthly. Data were analyzed using the Analysis of Variance and the differences among treatment means were computed using the Tukey's Honest Significant Difference. The results of the study revealed that the application of Alpha-Napthaleneacetic acid insignificantly affects plant height after one month of application since tillers clumps topped produce auxin while significant results were observed in number of leaves and number of tillers while highly significant result perceived by fresh weight which is a good characteristic of a pasture.

Key words: African pigeon grass, Alpha-Napthaleneacetic acid, Auxin, tillers

INTRODUCTION

Forage production and animal husbandry in the Philippines are interwoven with the intricate fabric of the society in cultural, religious and economical ways as mixed farming and livestock rearing forms an integral part of rural living. Although the contribution of agricultural sector to Philippine economy is steadily declining to 10% in Gross Domestic Product (GDP) and contributed to 30% in terms of total employment in 2014. In the same year, the country's earnings from agricultural exports were higher by 2.29 percent from the previous year's record. Import expenditures increased by 21.44 percent, the agriculture and livestock sector still provides employment to 32% of the work force (PSA, 2014). The current population of the Philippines is 103,541,341 or equivalent to 1.38% of the total world population and ranks number 13 in the list of countries (and dependencies) by population (www.Worldometers.info of United Nations, 2016). Moreover, more than a quarter of

Filipino adults (36%) claimed to be food insecure, while 23% of Filipino children said the same in the latest National Nutrition Survey (NNS) conducted in 2011.This lead to the conclusive statement that the country has the highest prevalence of food inadequacy among Asia's 'tiger cub economies from 2005-2012 (FAO, 2012). These problems are products of poor agricultural strategies, farming methods, technology and government supports especially in the livestock sector. In small livestock owners, one of main problems is higher price of feeds aside from lack of technical-know-how especially in pasture area management. One of the pasture grasses planted by many farmers is Setaria (*Setaria sphacelata*), also known as South African pigeon grass, African bristlegrass and golden timothy grass, is native to tropical and subtropical Africa. It is cultivated as pasture grass and fodder crop. It is a good source of quality feed and suitable for cut-and-carry. It can tolerate poor drainage and can survive in low fertility soil. Furthermore, the application of synthetic auxin plant hormone that is used for vegetative propagation of plants from stem and leaf cuttings and also in plant tissue culture one of the synthetic auxins is α-Naphthaleneacetic Acid (NAA). The strategies in making their pastures easily growing using α-Naphthaleneacetic Acid is not yet even introduce and tried in the Municipality of Tagbina, Surigao del Sur. Thus this study was conducted.The study therefore aim to determine the effects of using various frequency application of ANAA in setaria production; and to evaluate the growth and yield of setaria using various frequency application of ANAA.

METHODOLOGY

Location and duration of the study

This research was conducted at the Pest and Disease Nursery of Surigao Del Sur State University-Tagbina Campus, Tagbina, Surigao Del Sur from February 25 to April 1, 2017 (Figure1).

Experimental design and treatments

The study was laid out using Complete Randomized Design (CRD) with four treatments and replicated three times.
The treatments were as follow:
T1=Control (Untreated)
T2=Weekly application
T3=Bi-weekly application
T4=Monthly application

Treatment preparation and application

Rooted tillers clumps topped to about 15 cm and separated into pieces each with 2-3 tillers were used as planting materials of *Setaria sphacelata*. The tillers were placed in moist news paper to avoid desiccation. The 4×10 inches plastic polyethylene pots were placed with 2.5 kilos per pot from thoroughly mixed soil taken from the same location. The 2-3 tillers were planted at 3 inches depth. The 4 tbs NAA per 16 liters of tap water was mixed and applied using hand pressurized sprayer and application frequencies was based on the frequency set as treatment. To avoid chemical mists to other treatments a 1x1.5m “trapal” was cut and used as buffering material.

Data gathered

The data gathered in this research were; plant height (cm), number of leaves, number of tillers and fresh weight (g). These were taken at termination a week after the last treatment was applied.

Statistical analysis

The data were gathered, tabulated and analyzed using Analysis of Variance (ANOVA) in Complete Randomized Design (CRD). The significant difference among treatment means were further analyzed using Honestly Significant Difference (HSD) Test at 5% level of significance.

RESULTS AND DISCUSSION

Plant height

The summary on the mean of plant height as affected by varying frequency application of NAA is shown in (Table 1 and Figure 2). Statistical analysis revealed not significant differences among treatments.

The result implies that the use of α-Naphthaleneacetic Acid (NAA) provide not significant in terms of plant height. Auxin has been associated with core growth processes such as tropic growth and apical dominance in many plants.

Overall, hormone-responsive gene sets include genes involved in many cellular processes, including hormone regulation, signal transduction, metabolism, transcription, cell expansion, and cell division (Mauseth, 1991 and Raven et al., 1992).

According to Davies (1995), the effect of NAA on the plant growth is greatly dependent on the time of admission and concentration.

However, Salisbury and Ross, (1992) stated that plant itself produces a naturally occuring auxin that enhances growth especially when other factors like healthy soil, relative humidity, temperature and other biotic factors are present.

Figure 1. Pest and Disease Nursery of Surigao Del Sur State University-Tagbina Campus, Tagbina, Surigao Del Sur.

Table 1. Mean plant height (cm) of *Setaria sphacelata* as applied with NAA at various frequencies.

Treatment	Plant Height (cm)			Total	Mean^{ns}
	I	II	III		
Untreated	64.30	74.60	66.50	205.40	68.47
Weekly	57.30	62.00	71.50	190.80	63.60
Bi-weekly	75.70	79.00	72.00	226.70	75.57
Monthly	65.00	77.80	49.80	192.60	64.20
Grand Total				815.50	
Grand Mean					67.96

CV (%) = 12.54

Table 2. Mean number of leaves of *Setaria sphacelata* as applied with NAA at various frequencies.

Treatment	Number of leaves			Total	Mean*
	I	II	III		
Untreated	14.00	14.00	12.00	40.00	13.33^{b}
Weekly	28.00	27.00	26.00	81.00	27.00^{a}
Bi-weekly	22.00	18.00	15.00	55.00	18.33^{ab}
Monthly	22.00	22.00	35.00	79.00	26.33^{a}
Grand Total				255.00	
Grand Mean					21.25

CV (%) = 19.83
HSD (ά 0.05) = 5.72 ; HSD (ά 0.01) =10.66
Means having the same letter superscript are not significantly different at 5% level of significance using HSD.

Number of leaves

The summary on the mean of number of leaves as affected by varying frequency application of NAA is presented in (Table 2). Statistical analysis revealed significant differences among treatments. In one month periods, setaria grass applied with weekly and monthly obtained higher number of leaves grown having a mean of 27.00 and 26.00, respectively. Moreover, bi-weekly is similar with the untreated check.

Number of tillers

The summary on the mean of number of tillers as affected by varying frequency application of NAA is presented in (Table 3). Statistical analysis revealed

Figure 2. Untreated (A), Weekly application (B), Bi-weekly application (C), Monthly application (D), Counting of leaves and tillers (E), Weighing of setaria (F) and recording (G).

Table 3. Mean Number of tiller of *Setaria sphacelata* as applied with NAA at various frequencies.

Treatment	Number of Tillers			Total	Mean*
	I	II	III		
Untreated	3.00	3.00	2.00	8.00	2.67[b]
Weekly	7.00	6.00	6.00	19.00	6.33[a]
Bi-weekly	5.00	4.00	4.00	13.00	4.33[ab]
Monthly	4.00	5.00	9.00	18.00	6.00[a]
Grand Total				58.00	
Grand Mean					4.83

CV (%) = 29.26
HSD (ά 0.05) = 1.92 ; HSD (ά 0.01) =3.58
Means having the same letter superscript are not significantly different at 5% level of significance using HSD.

Table 4. Mean fresh weight (g) of *Setaria sphacelata* as applied with NAA at various frequencies.

Treatment	Fresh Weight (g)			Total	Mean**
	I	II	III		
Untreated	15.00	15.00	18.00	48.00	16.00[c]
Weekly	55.00	60.00	54.00	169.00	56.33[a]
Bi-weekly	45.00	42.00	39.00	126.00	42.00[b]
Monthly	42.00	45.00	67.00	154.00	51.33[a]
Grand Total				497.00	
Grand Mean					41.42

CV (%) = 17.44
HSD (ά 0.05) = 9.80 ; HSD (ά 0.01) = 18.27
Means having the same letter superscript are not significantly different at 5% level of significance using HSD.

significant differences among treatments. The result implies that the use of α-Naphthaleneacetic acid (NAA) provide not significant in terms of number of tillers. *De novo* auxin production is highly localized and local auxin biosynthesis plays a key role in shaping local auxin gradients. The predominant view in the auxin field has been that polar auxin transport is responsible for generating auxin gradients and auxin maxima, known to

be essential for proper plant development (Cheng et al., 2006; Cheng et.al, 2007; Stepanova et al., 2008; Tao et al., 2008). Recent progress in auxin biosynthesis makes it practical to alter auxin levels with temporal and spatial precision, providing exciting tools with which to tackle complex questions regarding the mechanisms of how auxin controls plant development.

Fresh weight

The summary on the mean of fresh weight (g) as affected by varying frequency application of NAA is shown in (Table 4). Statistical analysis revealed highly significant differences among treatments. In one month periods, setaria grass applied with weekly, monthly and bi-weekly obtained an average fresh weight (g) of 56.33 g, 51.33 g, and 42.00 g compared to untreated check. Plants employ many ways to control auxin levels thus to ensure proper growth and development (Salisbury and Ross, 1992).

Conclusion

Based on the results, application of Alpha-Napthaleneacetic acid does not affect plant height after one month of application since tillers clumps topped produce auxin while significant results were observed in number of leaves and number of tillers while highly significant result perceived by fresh weight which is a good characteristic of a pasture. It is therefore recommended to use weekly and monthly application of Alpha-Napthaleneacetic acid. Also, to extend the length of time, increase replications and performed research in the field.

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