RESPONSE on GROWTH of *Vetiveria zizanioides* L. on GIBERELLIN UNDER SALINITY STRESS CONDITIONS

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ABSTRACT

The aim of this study was to evaluate the responsiveness of growth of Vetiveria Zizanioides L in giberellin under salinity stress conditions. This research was conducted in a greenhouse of Agriculture Faculty, University of Sumatera Utara, Medan. The study used utterly Non Factorial Complete Randomized Design. The long-term goal in this research was that in conditions where the plant experiences salinity stress, secondary plant metabolites increase so that they can improve the quality and yield of *Vetiveria zizanioides* oils. The results of this study was expected to provide information to fragrant root farmers / planters regarding the growth of *Vetiveria zizanioides* on giberellin in salinity stress.
Keywords: Gibberellic Acid, Salinity, Vetiveria Zizanioides.

A. INTRODUCTION

Fragrant root (Vetiveria zizanioides) is one of the plants producing essential oils commonly called vetiver oil. This oil is widely used in the manufacture of perfumes, cosmetics, perfuming soaps, medicines, and insecticides and deterrent. Vetiver oil has a soft and delicate aroma due to esters of vetinenic acid and the presence of vetivenol compounds (Ghotbizadeh and Sepaskhah, 2015). The same thing was stated by Esyanti (2013), stating that the fragrant root has a fragrant aroma and high fixative property, so that it is widely used as an industrial raw material such as making perfumes, cosmetics, deodorants, soaps, medicines, and also mosquito repellent. So the economic value of fragrant root oil is very high. However, fragrant root plants also function as inhibitors of erosion and soil rehabilitation, so land is increasingly limited for planting vetiver seedlings intended for oil vetiver production. Fragrant root plants are metal hyperaccumulators that have high absorption or accumulation properties of heavy metals in tissues plants. These plants are very tolerant of drought and flood, frost, heat, extreme soil pH, Al and Mn toxicity, and very tolerant for various metals such as As, Cd, Cu, Cr, and Ni (Aini and Idris, 2015).

Salinity has reached the level of 19.5% of all agricultural irrigated land throughout the world (FAO, 2005). One of the most important abiotic factors that limit plant germination and early seedling growth is water stress which causes drought and salinity (Almansouri et al., 2001), which is a widespread problem throughout the world (Soltani et al., 2006). Salinity can quickly inhibit root growth so that the absorption capacity of water and essential mineral nutrients from the soil. Salinity stress causes reduced cell turgor and pressure levels from roots and shoots (Werner and Finkelstein, 1995), suggesting that environmental salinity acts primarily on water absorption.

B. MATERIALS AND METHODS

The material used in this study was 6-month-old fragrant root seeds originating from Bogor as plant material, giberellin, decis, and others. The tools used in this study were polybags, refragtometers, plastic color labels, scissors, digital scales, calculators, stationery, microscopes, leaf area meters, chlorophyll meters and others. The design used in this study was a non factorial Complete Randomized Design (CRD), namely salinity stress (S) consisting of 3 factors: EC salinity level of 0 (distilled water), 4 and 8 ds / m. Each treatment was repeated 3 times, then 9 treatment combinations were obtained. If the treatment effect had significantly different on variance, a follow-up test with Duncan's multiple range test is performed.

Land Preparation. The land used was the greenhouse of the Faculty of Agriculture, University of North Sumatra. The land was cleaned thoroughly. Polybags were filled with soil in accordance with their respective treatments. The first treatment, polybags filled with top soil. The second treatment, polybags filled with saline soil (4 dsm-1). The third treatment, polybags filled with saline soil (8 dsm-1). The salinity of the soil was measured first according to each treatment. Copy soil is taken in the Percut area, Sei Tuan.

Seedling Ordering. Ordered uniform seeds. The seeds used in this study were derived from 6-month-old fragrant root seeds. The seeds come from fragrant root plantations (Vetiveria zizanioides L.) in Bogor Regency.

Seed Preparation. Fragrant root seeds were taken which had uniform growth, were not attacked by pests and diseases. If the plant has already been planted, a marker label was attached to make a marker on each plant plot.

Gibberellic acid treatment. Seeds were soaked in 500 ml of distilled water for 12 hours (no GA_3), and the seeds were immersed in 500 ml ofa solution of GA_3 for 12 hours and then redried to original weight with forced air under shade (Sundstrom *et al.*, 1987).

Salinity treatment. To apply the salinity treatment, given any treatment by the EC salinity levels at 0 and 4-5ds/m NaCl in each polybag according to the procedure, then at the level of salinity measurements done three times a week using DHL meters.

Parameter Observed:

Plant Height (cm). Plant height was measured at 4, 6 and 8 weeks after planting, measurements were taken from the root neck to the tip of the leaf using a meter.

Leaf Dry Weight (gr). Dry weight test was carried out by oven drying at 65°C for 24 hours to get the dry weight of the seeds (Seghatoleslami, 2010).

Specific Leaf Area (cm g-1). Specific leaf area was the leaf area per unit dry leaf weight. SLA values were calculated as the ratio between leaf area (L) and dry matter weight (BKdaun); so, SLA = L: BK leaves, the unit is cm2 g-1 (Suwarto, 2013). Analysis of specific leaf area was carried out at the Ecology Laboratory.

C. RESULTS and DISCUSSION

Gibberellin and salinity stress conditions showed a significant effect on the growth variables of vetiveria zizanioides such as the plant height, leave dry weight, specific leaf area (Table). Gibberellin markedly better impact on salt stress.

Treatment	Plant Height (cm)			Leaf Dry Weight (gr)	Specific Leaf Area (cm g-1)
	2 WAP	4 WAP	6 WAP		
Giberellin					
G0	32,67c	57,33bc	87,00bc	3,59c	6,42c
G1	55,33ab	113,00b	133,33b	4,20b	7,26b
G2	67,67a	152,67a	175,67a	4,61a	7,95a

Means values in a column and row followed by unlike letter (s) are significantly different at 5% level using BNT test

Giberellin had a significant effect on average plant height. G2 (67.67 cm) treatment was significantly different from G0 (32.67 cm) but had no significantly different from G1 (55.33 cm) for 2 WAP observations. G2 (152.67 cm) treatment was significantly different from G0 (57.33 cm) but not significantly different from G1 (113 cm) for 4 WAP observations. G2 (175.67 cm) treatment was significantly different from G0 (87 cm) but not significantly different from G1 (133.33 cm) for 6 WAP observations. Giberellin 50 ppm and 100 ppm increase plant height compared without administration of giberellin (G0) for each type of observation (ages 2, 4 and 6 WAP). In the process ofgermination, Gibberellic Acid (GA_3) is the most important growth regulator, which breaks seed dormancy, promotes germination, internodal length, hypocotyl growth and cell division in cambial zone and increases the size of leaves. GA stimulates hydrolytic enzymes that are needed for the degradation of the cells surrounding the radicle and thus speeds germination by promoting seedling elongation growth of cereal seeds (Rood*et al*. 1990).

Giberellin gave a significant effect on the average dry weight of leaves. The treatment of 100 ppm Giberellin (G2 = 4.61 gr) and 50 ppm (G1 = 4.2 gr) increased the dry weight of leaves compared no Giberellin (G0 = 3.59 gr) for 6 WAP observations. Giberellin had a significant effect on the specific leaf area at the age of 8 WAP. The treatment of 100 ppm Giberellin (G2 = 7.95 cm g-1) and 50 ppm (G1 = 7.26 cm g-1) increased the dry weight of leaves compared to that without Giberellin (G0 = 6.42 cm g-1) for observation 6 WAP. GA 3 might help in the tolerance of plants to salt stress. It is also supported by the statement of Davies (1995), which states that the effect of gibberellin on stem growth, GA_1 causes hyperelongation of stems by stimulating both cell division and cell elongation. This hormone produces tall, as opposed to dwarf plants.In the bolting for long day plants, GAs cause stem elongation in response to long days.

Salinity stress can reduce the efficiency of electron transfer so that it will disrupt the performance of photosystem II. Salinity and leaf area are usually inverse relationships. With increasing salinity, water loss per plant through transpiration is also reduced. Attempts to improve yield under stress conditions by plant improvement have been mostly unsuccessful, primarily due to the multigenic origin of the adaptive responses. Therefore, a well-focused approach combining the molecular, physiological, biochemical and metabolic aspects of salt tolerance is essential to develop salt-tolerant crop varieties (Hoque *et al*. 2007.

D. CONCLUSION

Gibberellic acid and salinity on growth of *Vetiveria zizanioides* help maintain plant height, , leave dry weight, specific leaf area.

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