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YIELD POTENCY OF SWEET POTATO VARIETIES UNDER DROUGHT CONDITION IN SANDY LAND

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ABSTRACT

Sandy coastal in Yogyakarta have to develope land farming. Some problem to use its i.e soil texture, soil structure, high permeability, defisiency of nutrient essential, leaching, low soil surface , low water capacity and low nutrient essential fixation. The aim of this research was to study the cultivars of sweet potato (*Ipomoea batatas*) under drought condition in sandy land. A pot experiment was conducted from May to November 2013, in Experimental Station, Agricultural Faculty of UPNVY. It was arranged in Split Plot Design. The Main Plot was the sweet potato varieties: Beta -1, Beta -2, Papua Solossa, Sari, and Kidal. The Sub Plot was the drought condition: normal water, water stress for 1 week on 20 and 60 days after plant. Data were analyzed by anova and DMRT at 5%. The result showed that Kidal Variety had best tuber number and tuber weight. Papua Solossa variety had lower sugar and starch than another variety. Water stress had tuber number decreased but sugar and starch content increased.

***Key words**: sweet potatoes, variety, water stress, sandy land*

INTRODUCTION

Sweet potato (*Ipomoea batatas* (L.) Lam.) is one of carbohydrate producer plant which has development purpose for supporting diversificationof non-rice program, because sweet potato has high nutrition and contains of alpha enzyme and beta amylase which are useful for producing high maltose syrup (Rahayuningsih *et al*., 2004). Besides, sweet potato formulated with peanuts is good for industry raw materials especially baby food industry. Sweet potato products can be projected as animal feed, biodegradable plastic raw materials industry (Antarlina,1993).

Special Region of Yogyakarta has south beach sandy land area of 9,000 hectares, this land is marginal land along the beach, about 60% of its area has not been used optimally yet. The utilization of the sandy beach land started to be successfully developed after the irrigation network built (severally wells). The utilization of this non-permanent land contains vegetables like onion and chili (Lagiman, 2006 ; Kastono, 2007). The kinds of plant are limited is because cultivating on sand beach was not an easy thing because of physical, biological, and chemical of the land did not support. This is because the sand beach is contained of sands, low nutrition, low water saving ability, and high land

temperature. High wind speed causes high plant evapotranspiration. Daily land temperature is quite high reaching 30-40^{o}C in daytime. The high temperature causes plants dry (Partoyo, 2006).

Reported by Ravi dan Chowdhury (1999), the draught causing colocasia tuber grows slowly even decreases to 10-40%. The draught also causing potato plant roots not adaptive to undeveloped water stress (Opena dan Porter, 1999), inhibited potato tuber forming and tubers starch content decrease (Geigenberger *et a*l., 1999). According to Togari (1990), on field, tuber forming is very affected by its surrounding in the first 20 and 60 days after planting is the period of number of starch grains in the cells of sweet potato tubers forming.

Specific physical and chemical condition of the land needed for draught tolerant variety of plants. Draught adaptable plants tend to produce more stable plant (Pangaribuan *et al*., 2001). The journals for draught tolerant plant are many reported by (Frederique *et al*., 2000), for horticulture and corn plant, Maestri (2001), reported that draught tolerant plant will increasing the accumulation ofproline where proline acted as compatible osmolit and organic nitrogen reserve on plant used as long as draught occurred. Pangaribuan (2002), reported that the level difference of draught affect the growth of oil palm seedlings and the using of untolerant plant causing water efficiency decreased.

The research's purpose is for digging sweet potato varieties potency in draught pressure. The selection way is to give direct pressure on plant, the result of the method can be used afterwards. Draught tolerant variety is very useful for the sand land people to get an optimal production.

MATERIALS AND METHOD

The research method is held in Agriculture Faculty of UPN VYK field on bamboo house in May to November 2013. Factorial experimentis anexperiment (5x3) consists of 3 replications, arranged in a Split Plot Design. The main plot is consisted of 5 varieties from Balitkabi, Malang collection, they are 1) Beta -1, 2) Beta -2, 3) Papua Solossa, 4) Sari, dan 5) Kidal. Sub plot is consisted of three water stress varieties, they are 1) normal irrigated, 2) not irrigated for 1 week when the plant is 20 hst age (root forming age), and 3) not irrigated for 1 week when the plant is 60 hst age (tuber forming age). The layout is randomized according to group.

The plant material is shoot cuttings length 15-20 cm planted on planting tubs. The media used for the research is the mix of sand and dung 1 : 1. 1/3 dosage of NPK fertilizer 200 kg/ha given when planting and 2/3 of it given when the plant 60 hst age. Irrigation is done due to water stress treatment. Pest and disease control is done using preventing method.

RESULT AND DISCUSSION

On sweet potato case, its dry weight is buried in economically important part of plant which is its root. On field, tuber forming is very affected by its surrounding on the first 20 days after planting. The research showed that there was no interaction between the kind of

variety and draught stress treatment on tuber quantity analysis (Table 1) and tuber weight (Table 2).

.Tabel 1. Average of tuber/plant quantity

Variety	Draught			Average
	C1 (without stress)	C2 (20 HST)	C3 (60 HST)	
V1 (Beta 2)	5,42	4,33	3	4,25 b
V2 (Papua Solosa)	4,67	2,33	2,83	3,28 c
V3 (Sari)	7,22	5,46	4,08	5,59 a
V4 (Beta 1)	3,58	2,83	3,17	3,19 c
V5 (Kidal)	6,67	5,75	5,5	5,97 a
Average	5,51 p	4,14 q	3,72 q	(-)

Note: the average on same letter on the same column (a,b,c) and same line (p,q,r) shows no difference with Duncan test 5%. (-) : no interaction

Table 1 shows that either stress or variety has real effect and varies result on tuber quantity. V3 (Sari) and V4(Beta 1) resulted the most tuber quantity compared to other tuber variety. Unstressed plant (C1) resulted the most tuber compared to Stressed plant (C2 and C3) but not with tuber weight (Table 2). Stressed or untressed plant resulted the same tuber weight. This proves that sweet potato has good tolerance for draught, as stated by Hahn and Hozyo (1992).

The result on the field was affected by the kind of variety. Sari and kidal variety resulted high tuber quantity and weight (Table 1 and 2). This might be because of photosynthesis rate affected by the shape of the leaves. Smaller sari and kidal variety leaves caused draft, temperature, relative humidity, and light intensity could increase the rate of photosynthesis because these factors are affected CO_2 assimilation.

Table 2. Average of tuber/plant weight (g)

Variety	Draught			Average
	C1 (without stress)	C2 (20 HST)	C3 (60 HST)	
V1 (Beta 2)	430	400	370	400 a
V2 (Papua Solosa)	250	220	490	320 b
V3 (Sari)	410	340	420	390 a
V4 (Beta 1)	260	440	200	300 b
V5 (Kidal)	500	320	400	206,67 c
Average	370 p	344 p	376 p	(-)

Note: the average on same letter on the same column (a,b,c) and same line (p,q,r) shows no difference with Duncan test 5%. (-) : no interaction

The components of sweet potato result are determined the fisrt time by the quantity of tuber roots, then divisionandcellenlargementdetermine thesize of thetuber, they lead to synthesis ofstarchgrainswhichdeterminesthe density ofstarchin thecells (Togari, 1990).

Table 3. Average of tuber/plant sugar level (%)

Variety	Draught			Average
	C1 (without stress)	C2 (20 HST)	C3 (60 HST)	
V1 (Beta 2)	17,648	18,841	18,740	18,41 b
V2 (Papua Solosa)	22,518	28,397	28,118	26,34 a
V3 (Sari)	18,575	18,064	19,041	18,56 b
V4 (Beta 1)	18,237	17,724	15,259	17,07 b
V5 (Kidal)	25,510	24,891	24,648	25,02 a
Average	20,498 q	21,583 p	21,161 p	(-)

Note: the average on same letter on the same column (a,b,c) and same line (p,q,r) shows no difference with Duncan test 5%. (-) : no interaction

Draught stress done to sweet potato resulted in tuber starch content increased compared to unstressed plant (Table 3). The same thing happened to tuber level of sugar (Table 4). This was because there's change in one result component under environmental influences often causing adjustment of other components in the plant (Togari 1990). Table 3 and 4 informed that sweet potato varieties showed different responses based on their surroundings. Small leaf variety (Kidal) showed high response on its surrounding. This was because the effect of different genetic character on each variety.

Table 4. Average of tuber/plant sugar level (brix)

Variety	Draught			Average
	C1 (without stress)	C2 (20 HST)	C3 (60 HST)	
V1 (Beta 2)	10,83	13,5	13,33	12,55 a
V2 (Papua Solosa)	11,67	13	11,5	12,06 b
V3 (Sari)	14	13,17	11,5	12,89 a
V4 (Beta 1)	11,67	14,67	11,33	12,55 a
V5 (Kidal)	9,5	14,17	14	12,55 a
Average	11,53 q	13,7 p	12,33 q	(-)

Note: the average on same letter on the same column (a,b,c) and same line (p,q,r) shows no difference with Duncan test 5%. (-) : no interaction

CONCLUSION

Sweet potato variety has character genetically different and does not affected by stress on tuber quantity and weight, sugar level, and tuber sugar. The stress done to 20 hst plant resulted best starch content and tuber sugar. Recommended variety for cultivating on sandy land is Kidal variety.

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