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MULTILOCATION TEST OF SWEET POTATO CLONES (IPOMOEA BATATAS L.) AT THE SWEET POTATO PRODUCTION CENTER IN EAST JAVA, INDONESIA

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ABSTRACT
This study aims to determine the yield potential of sweet potato in production centers such as Blitar, Malang and Mojokerto. In addition, this study also aims to identify clones that have high yield potential for sweet potato in production centers such as Blitar, Malang and Mojokerto. This study also aims to determine stable and adaptive clones in these three regions. The study was conducted from April to July 2020. The planting material used in this study included 3 hybrid sweet potato clones, including BIS-OP-61-OP-37, BIS OP-61-♂-13, Beta 2-♀- 29 and 2 control varieties, namely Beta-2 and Sari. The research design used RBD (Randomized Block Design) with 3 sweet potato clones as the main ingredient and 2 varieties as a comparison material. The test used in this study was repeated 3 times, so that 15 plots were obtained at each location and 45 plots at 3 locations. Data analysis used combined analysis of variance as well as stability and adaptability tests. Clone BIS OP-61-♂-13 was a stable and adaptive clone at all locations on the characters of tuber weight, stover weight, tuber yield and stover yield. Clone BIS OP-61-OP-37 clone which was unstable but had the highest average tuber weight and tuber yield at 3 locations. Clone BIS OP-61-♂-13 is a stable and adaptive clone with lower tuber yield BIS OP-61-OP-37.

KEY WORDS
Adaptability, stability, sweet potato.

Sweet potato (I*pomoea batatas* L.) is a plant native to tropical regions of the Americas, including the family *Convolvulaceae*, genus *Ipomoea*. Sweet potatoes spread throughout countries that have a tropical climate, then in the 16th century the spread of sweet potatoes began to penetrate the Asian region, especially in Philippines, Japan and Indonesia which was spread by the Spanish people (Purwono and Purnamawati, 2007). Among the 400 species of *Ipomoea*, only sweet potatoes have high economic value so that they become cultivated commodities, this is also supported by Wahyuni and Wargiono (2012) sweet potatoes are one of the genera that are often cultivated commercially among the genus.

Sweet potato (*Ipomea batatas* L.) is included in the type of crop which is one of the sources of carbohydrates (Balitkabi, 2020) and functions as a substitute plant for rice (Zuraida and Supriati, 2001). According to Rayahuningsih (2003), Indonesia is one of the largest centers of sweet potato genetic diversity in Asia Pacific. A total of 1251 sweet potato accessions from all regions in Indonesia, of which most or 577 accessions came from Irian Jaya Papua.

Sweet potatoes include dicotyledonous plants classified as annuals (short-lived) with normal growing periods ranging from 3 – 7 months, depending on the growing environment and cultivars grown. Wargiono (1980) suggests several important botanical properties of sweet potatoes including woodless stems, rounded shoulders with terraces in the middle consisting of cork, have internodes and on each segment grow leaves, roots and shoots / branches, the length of the main stem varies according to variety. This plant is quite easy to manage, resistant to drought stress and has a very high nutritional content including fiber, natural sugars, complex carbohydrates, protein, folate, vitamins A and C, potassium, sodium, iron and calcium (Rahayunigsih, 2003). Every 100 grams of sweet potato contains 124 calories, 1.8 grams of protein, 0.7 grams of fat, 27.9 grams of carbohydrates, 60 SI of vitamin A, 0.90 mg of B vitamins and 30 g of calcium. The current use of sweet potatoes in Indonesia has begun to be glimpsed by industry, one of which is used as fermentation of alcoholic beverages and bio-ethanol fuel (Widodo et al., 2015).

Different genotypes respond differently to variations in their growing environment. The growth of a genotype not only explains its genetic potential, but also its interaction with environmental factors (climate, soil type, etc.) (Shahzad et al., 2019). Using different varieties in the same growing environment will show the adaptability of different varieties. If the effect of the interaction is large, it will directly reduce the contribution of genetics to the final appearance of the genotype.

The utilization of sweet potatoes as an alcohol ingredient according to Govindarajan et al., (2019) is very suitable for fermentation because sweet potatoes are one of the commodities rich in starch. Certain variety that has dry matter high sweet potatoes will produce high starch yields, so that they become more suitable to use in the starch industry (Minantyorin and Andarini, 2016).The utilization of sweet potatoes in developed countries, such as in China, around 15-20% processed into starch which is then used as raw material for the manufacture of syrup, noodles and textile industries, besides that in the United States sweet potatoes are processed to be canning and freezing to facilitate accommodation (Akoetey et al., 2017). Another research test of sweet potatoes processed into sauce showed that the preferred substitution sauce was 60% red sweet potatoes and 40% tomatoes. This composition provides a fairly high carotene content of 2318.47 SI of vitamin A, while the carotene content of sauce from 100% tomatoes is only 1252.87 SI of vitamin A (Jusuf et al., 2015).

There are only 24 varieties of sweet potato in Indonesia that have been released until now, so that new varieties are needed to support the fulfillment of these needs. Assembling sweet potato varieties which are the basis for the selection of desired superior seeds is one of the ways to get sweet potatoes that have high yields and have high stability. The concept of stability states that the goal of plant breeding caused by genotype x environment interaction is to obtain genotypes with high yields and stability in wide environmental variations, obtaining high-yield genotypes in a given environment (Sjamjiah et al., 2016).

Sweet potato production in Indonesia only contributes 6% of sweet potatoes from the world's total sweet potato needs (Giri and Sakhale, 2019). Demand for sweet potatoes in domestic market and in export market has increased, while sweet potato production in Indonesia continues to decline. Sweet potato production from 2016 to 2017 decreased by 6.45% (Ministry of Agriculture, 2018). According to (Saitama et al., 2017) the increasing utilization of sweet potatoes causes the increased demand, but it is not accompanied by increased production. The decrease in production is due to the decreasing area of harvested land. Efforts to increase sweet potato production is influenced by internal factors, namely genetics and hormones and external, namely water, mineral soil, air humidity, air temperature, light.

The productivity of sweet potatoes is influenced by genetic factors and environmental factors where it grows, the more suitable the growing environment, the higher the productivity results (Febriyanto et al., 2016) To get a variety with good production ability, it is necessary to conduct adaptation tests on the to be tried-variety, mainly intended to find out clones that have appropriate adaptability and stability in current industrial needs. This research activity is intended to test the productivity of sweet potato clones in sweet potato production centers in East Java including Malang, Blitar and Mojokerto. So that later the results of this research can be one of the stage efforts for the development of sweet potatoes in Indonesia.

MATERIALS AND METHODS OF RESEARCH

This research was carried out in three different locations, namely in Karanggayam village (Blitar) with an altitude of 106.07 meters above sea level, Tambakrejo village (Malang) with an altitude of 342.12 meters above sea level, and Cepokolimo Village (Mojokerto) with an altitude of 612.79 meters above sea level. This research was conducted in April-July 2020. The planting material used in this study included 3 clones of sweet potatoes from crosses including BIS-OP-61-OP-37, BIS OP-61-♂-13, Beta 2-♀-29 and 2 comparison varieties, namely Beta-2 and Sari. Supporting materials for the implementation of research are single fertilizers, compound fertilizers and pesticides. The chemical fertilizer needed for yam plants for a land area of 1 Ha is as much as 200 kg urea + 100 kg SP36 + 150 kg KCL.

The design used in this study was RBD (*Randomized Block Design*) with 3 sweet potato clones as the main material and 2 varieties as comparison material. The tests used in this study were 3 replications, so that 15 experimental plots were obtained at each location and 45 experimental plots at 3 locations. The quantitative variables of the study consisted of the number of tubers, tubers weight/plant, stover weight/plant, tuber yield (ha^{-1}), and the stover yield (ha^{-1}).

Data analysis that used in this research was the combined ANOVA, stability and adaptability tests using PBSTAT-GE software. The stability test was based on the results of regression analysis according to Eberhart and Russell (1996) which are determined by the value of the regression coefficient (bi) and the deviation of the regression coefficient (sd^2). If the value of the regression coefficient is close to 1 and the value of the regression deviation is close to 0, then a genotype has stable results.

Adaptability tests were based on the results of analysis according to Finlay and Wilkinson (1963). Regression coefficient testing was performed using a 5% t-test. If t calculate the value of the regression coefficient (bi) was not greater than t of the table, then it was not significantly different from one (bi=1). Conversely, if t count is greater than t of the table, then it was markedly different from one. If the regression coefficient value was (b=1) then the genotype adapts generally across test sites. If the value of the regression coefficient (b>1) then the genotype adapts specifically in a productive location. Whereas, if the value of the regression coefficient (b<1) then the genotype adapts specifically in the marginal environment.

RESULTS AND DISCUSSION

Table 1 describes the differences in microclimate at the 3 study sites. It can be known that the lowest elevation to the highest elevation is sequentially at the location of Blitar with an altitude of 106.07 masl, Malang 342.12 masl and in Mojokerto 612.79 masl.

Table 1 – Microclimate of the Research Site (World Weather, 2020)

Micro	Blitar				Malang				Mojokerto			
	April	May	June	July	April	May	June	July	April	May	June	July
Elevation (masl)	106,07				342,12				612,79			
Soil Type	Alluvial				Alfisol				Andosol			
Rainfall (mm)	273,6	270,8	37,5	11,6	479,1	186,9	28,7	20,9	312,6	178,8	24,6	16,2
Max Temp(ºC)	30ºC	30ºC	29ºC	28 ºC	31 ºC	31ºC	31ºC	31ºC	31ºC	30ºC	30ºC	30ºC
Min Temp(ºC)	23ºC	23ºC	22ºC	21 ºC	24 ºC	24ºC	23ºC	23ºC	23ºC	23ºC	22ºC	21ºC
Average Temp(ºC)	26ºC	26ºC	25ºC	24 ºC	27 ºC	27ºC	26ºC	26ºC	26ºC	26ºC	25ºC	25ºC

Description: Temp= Temperature, Max= Maximum, Min= Minimum.

Table 2 – Environmental Index

Character	Blitar	Malang	Mojokerto
NT	-0,62	0,82	-0,20
TW	-0,11	-0,02	0,13
SW	0,48	-0,15	-0,32
TY	-1,97	-1,48	3,45
SY	21,82	-8,55	-13,26

Description: NT= Number of Tubers, TB= Tuber Weight, SW= Stover Weight, TY= Tuber Yield, SY=Stover Yield.

A genotype can bring out the character and components of plant products according to the conditions of the growing environment. Every environment will certainly have different conditions. The difference is measured using environmental index values. The value of the environmental index is needed related to the level of suitability of the location of the land with certain characteristics raised by plants. The value of the environmental index is divided into two, the positive value includes the criteria of productive land and the negative value of the environmental index that is categorized as a marginal environment.

Table 2 shows the environmental indices at 3 study sites. It can be noted that the analysis of environmental indices shows varying results. In the character number of tubers, only in Malang shows a positive value of 0.82. While in the tuber weight character, only Mojokerto shows a positive value of 0.13. Then the stover weight character is only in Blitar which shows a positive value of 0.48. Furthermore, characters of tuber yield only Mojokerto showed a positive result of 3.45. In the character of stover yield, there is a significant difference in results, where at the location of Blitar the positive value is 21.82.

Table 3 – Combination Analysis of Variance

Character	Location	Replication (Location)	Clones	GXE
NT	8,31**	0.11	2,14**	0,33**
TW	0,23**	0.00	0,39**	0,03**
SW	2,64**	0.01	0,10**	0,06**
TY	134,78**	11.73	492.84**	55,99**
SY	5.436,73**	30.11	86,63**	90,13**

*Description: NT= Number of Tubers, TW= Tuber Weight, SW=Stover Weight, TY= Tuber Yield, SY=Stover Yield, *: significantly different at the test level of 5%, **: significantly different at the test level of 1%, tn: Not significant.*

In (table 3), can be seen the results combination analysis of variance location, clones and GxE shows that all characters produce a real difference at the level of 1%. The interaction that occurs between the genotype and the environment gives the appearance of different phenotypes at each clones, as well as different environments. The influence of GXE sweet potato planting has made a considerable contribution to the research of iss and Maulana (2020), in other studies also showed the same thing according to Purwokurniawan et al. (2014), Ngailo et al. (2019) on sweet potato research in Tanzania, and Hastini et al. (2020) on rice field research in Indonesia.

The results of analysis of variance combined at three locations on the character of the number of tubers showed significant results with a level of 1% at the site of 8.31, clone of 2.14 and GXE of 0.33. The high value at the location of 8.31 explains that the very high difference in the character of the number of tubers/plant is due to the influence of location on the character stover weight/plant and stover yield also show if the character is influenced by location on the weight tuber/plant and tuber yield affected by clones.

Table 4 – Stability and Adaptability Number of Tubers

Clone	x̄	bi=1	Sd²=0	S	(A)	Blitar			Malang			Mojokerto		
BIS OP-61-OP-37	2,97	0.93tn	-0.03tn	ST	A	2,42	c	A	3,75	b	B	2,74	b	A
BIS OP-61-♂-13	1,91	0,37**	0.01tn	TS	A-	1,80	b	A	2,26	a	B	1,67	a	A
Beta 2- ♀-29	2,45	1,49*	0.01tn	TS	A+	1,41	a	A	3,64	b	C	2,29	b	B
Beta 2(control)	2,45	1.15tn	0.01tn	ST	A	1,62	ab	A	3,35	b	C	2,39	b	B
Sari(control)	1,75	1.06tn	-0.01tn	ST	A	1,18	b	A	2,65	a	B	1,41	a	A
Average	2,31					1,69			3,13			2,10		
BNT 5%						0,51								

Description: x̄ = mean, bi=regression coefficient, Sd² = deviation regression coefficient, S = stability, (A) = Adaptability, ST= Stable, TS, Unstable, A= Adaptive A-= Adaptive marginal land, A+= adaptive productive land.

Based on (table 4), it can be seen that the BIS OP-61-OP-37, Beta 2 (control) and Sari (control) clones had regression coefficient values and regression deviations that were not significantly different, so that all three were declared stable and broadly adaptable to all test environments. Clone BIS OP-61-♂-13 and clone Beta 2-♀-29 showed significantly different regression coefficients, but clone BIS OP-61-- ♂-13 showed a regression coefficient >1, so it was categorized as a clone with narrow adaptation to marginal environment while clone Beta 2-♀-29 showed a regression coefficient <1 so that it was categorized as a clone with narrow adaptation to a productive environment. The stability and adaptability of the number of tubers is strongly influenced by the genotype, the environment, and the interaction between the genotype and the environment. The number of tubers is also influenced by the interaction of genetic factors (genetic potential) and environmental factors consisting of soil moisture (Mau et.al, 2013). In addition, the number of tubers is also influenced by factors such as soil type, soil structure and texture; this is due to the structure and texture of sweet potato soil affecting the plant's ability to develop optimally in its generative phase. The three locations that show the highest notation are the Malang location compared to Blitar and Mojokerto. The highest clone at the location in Blitar is BIS OP-61-OP-37 and is significantly different from the other clones.

Table 5 – Stability and Adaptability of Tuber Weight

Clone	$\bar{x}$	bi=1	Sd^2=0	S	A	Blitar			Malang			Mojokerto		
BIS OP-61-OP-37	0,74	1.60^{tn}	0,03***	TS	A+	0,65	c	B	0,56	d	A	1,01	d	C
BIS OP-61-♂-13	0,40	0.89^{tn}	0.00 ^{tn}	ST	A	0,30	b	A	0,40	c	B	0,52	c	C
Beta 2-♀-29	0,22	0.45^{tn}	0.00 ^{tn}	ST	A	0,15	a	A	0,24	a	B	0,27	a	B
Beta 2(control)	0,29	1.28^{tn}	0,01***	TS	A+	0,10	a	A	0,35	bc	B	0,42	bc	B
Sari(control)	0,28	0.79^{tn}	0.00 ^{tn}	ST	A	0,17	a	A	0,31	ab	B	0,37	b	B
Average	0,39					0,27			0,37			0,52		
BNT 5%						0,07								

Description: $\bar{x}$ = mean, bi=regression coefficient, Sd^2 = deviation regression coefficient, S = stability, (A) = Adaptability, ST= Stable, TS, Unstable, A= Adaptive A-= Adaptive marginal land, A+= adaptive productive land.

The combination analysis of variance tuber weight characters (kg/plant) showed significant results with a level of 1% at location 0.23, clone 0.39 and GXE 0.03. The high calculated F value of these clones explains that the very large differences in tuber weight (kg/plant) are caused by the influence of the clones. Based on (table 5), it can be seen that the BIS clones OP-61-♂-13, Beta 2 -♀-29 and Sari (control) had regression coefficient and regression deviation values that were not significantly different, so that all three were declared stable and adaptive. Clones BIS OP-61-OP-37 and Beta 2 (control) had regression coefficient values that were not significantly different and their regression deviations were significantly different >1, so that both were declared unstable and specially adapted to productive environments. Judging from the average tuber weight value, the clone with the highest yield potential was the BIS OP-61-OP-37 clone, but this clone was unstable and adapted compared to the BIS OP-61-♂-13, Beta 2 -♀-29 and Sari clone (control).

The tuber weight is closely related to the plant's ability to produce. The tuber weight is affected by the formation and enlargement process which requires sufficient potassium nutrients. In addition, tuber weight is also affected by photosynthetic results stored in the roots and roots develop into tubers (Endah et al., 2006). In addition, tuber weight is also influenced by sufficient and balanced nutrients so that root crops can grow optimally (Sudirja, 2007).

Table 6 – Stability and Adaptability of Stover Weight

Clone	$\bar{x}$	bi=1	Sd^2=0	S	A	Blitar			Malang			Mojokerto		
BIS OP-61-OP-37	0,78	1.19^{tn}	0,08***	TS	A+	1,40	c	C	0,37	a	A	0,58	b	B
BIS OP-61-♂-13	0,55	0.88^{tn}	0.00^{tn}	ST	A	0,96	a	C	0,44	a	B	0,24	a	A
Beta 2 ♀–-29	0,72	0.91^{tn}	0,03**	TS	A-	1,13	a	C	0,72	b	B	0,32	a	A
Beta 2(control)	0,60	0.92^{tn}	0.00^{tn}	ST	A	1,03	a	B	0,46	a	A	0,29	a	A
Sari(control)	0,77	1.10^{tn}	0.00^{tn}	ST	A	1,28	b	C	0,65	b	B	0,37	a	A
Average	0,68					1,16			0,53			0,36		
BNT 5%						0,18								

Description: $\bar{x}$ = mean, bi=regression coefficient, Sd^2 = deviation regression coefficient, S = stability, (A) = Adaptability, ST= Stable, TS, Unstable, A= Adaptive A-= Adaptive marginal land, A+= adaptive productive land.

The combination analysis of variance character stover weight (kg/plant) shows that the location, clone and the interaction between the clone and the environment has a significant effect at the level of 1%. It can be said that the stover weight (kg/plant) is influenced by the location factor of 2.64, clone 0.10 and GXE 0.06. The high F value calculated at the location explains if the very difference in the character of tuber weight (kg/plant) is due to the influence of the location used for the trial.

Based on (table 6), it can be seen that the BIS clones OP-61-♂-13, Beta 2 (control) and Sari (control) have regression coefficient values and regression deviations that are not significantly different, so that all three are declared stable and adaptive. Clone BIS OP-61-OP-37 and Beta 2 -♀-29 showed regression coefficient values that were not markedly different and showed regression deviation values that were markedly different. Clone BIS OP-61-OP-37 has a regression coefficient value of >1, so it is categorized as an unstable clone with adaptability in a productive environment. While the Beta 2 -♀ -29 clones have a regression coefficient value of <1, so they are categorized as unstable clones with adaptability in marginal environments.

The weight of the stover is closely related to plant growth which is the accumulation of photosynthetic products and water content in plants. The weight of the stover is greatly influenced by the absorption of plant water so that the roots play a role in increasing the fresh weight of the stash plant (Fariz et al., 2022). The weight of the stover is influenced by the distribution of the results of photosynthesis to the vegetative parts of the plant. In the early days of sweet potato growth, photosynthesis are used in the process of forming vegetative organs and gradually decrease when tubers begin to form or enter the generative phase. (Rahakabauw and La Kolaka, 2021). In addition, the weight of the stover indicates good growth of root plant organs so that they are able to absorb water and cell division (Ceunfin &; Bere, 2022). Based on the result of the BNT 5%,clone BIS OP-61-OP-37 was significantly different from other clones in Malang and Mojokerto locations. Locations in Blitar showed the highest results and were significantly different from locations in Malang and Mojokerto.

Table 7 – Stability and Adaptability of Tuber Yield

Clone	x̄	bi=1	Sd²=0	S	A	Blitar			Malang			Mojokerto		
BIS OP-61-OP-37	25,25	2.36 ^{tn}	62,65 ***	TS	A+	25,97	c	B	15,87	b	A	33,92	c	C
BIS OP-61-♂-13	14,08	0.68 ^{tn}	0.19 ^{tn}	ST	A	11,94	b	A	13,97	b	AB	16,33	b	B
Beta 2 ♀–-29	7,43	0.48 ^{tn}	-0.85 ^{tn}	ST	A	6,07	a	A	7,20	a	A	9,03	a	A
Beta 2(control)	10,15	1.17 ^{tn}	33,61 ***	TS	A+	3,88	a	A	12,78	b	B	13,78	b	B
Sari(control)	7,64	0.32 ^{tn}	-1.19 ^{tn}	ST	A	6,83	a	A	7,35	a	A	8,73	a	A
Average	12,91					10,94			11,43			16,36		
BNT 5%						3,27								

Description: x̄ = mean, bi=regression coefficient, Sd² = deviation regression coefficient, S = stability, (A) = Adaptability, ST= Stable, TS, Unstable, A= Adaptive A-= Adaptive marginal land, A+= adaptive productive land.

The combination analysis of variance at three locations on tuber yield characters (t ha-1) showed significant results with a level of 1% at location 134.78, clone 492.84 and GXE 55.99. The high clone value of 492.84 explained that the real difference in tuber yield characters (t ha-1) was caused by the influence of the test clones. Based on (table 7), it can be seen that the BIS clones OP-61-♂-13, Beta 2-♀-29 and Sari (control) showed that the values of the regression coefficients and regression deviation were not significantly different, so that all three were declared stable and adaptive. Whereas clones BIS OP-61-OP-37 and Beta 2 (control) had regression coefficient values that were not significantly different and regression deviation > 1 so that the two clones were categorized as unstable and adaptive clones in a productive environment.

Yield of sweet potato showed the same results as the character of stover weight in BIS OP-61-OP-37 clones in Blitar and Mojokerto, significantly different from other clones. The tuber yield is closely related to the cultivation that will be carried out by farmers. According to Jedeng (2011), in general, the level of crop production is highly dependent on the variety, the method of farming and the environmental conditions of the cultivated plants. Different varieties play a role in utilizing the environment to achieve high yield potential (Manullang et.al., 2017). The environment greatly affects the stability and adaptability of plants, controlling temperature and soil moisture reduces the potential for pest and disease attacks so that the production results obtained will be better (Kadarso, 2008).

Table 8 – Stability and Adaptability of Stover Yield

Clone	x̄	bi=1	Sd²=0	S	A	Blitar			Malang			Mojokerto		
BIS OP-61-OP-37	28,63	1,20 tn	105,04 ***	TS	A+	55,82	b	C	10,48	a	A	19,60	b	B
BIS OP-61-♂-13	20,52	0,84 tn	1,78 tn	ST	A	38,50	a	C	15,40	ab	B	7,67	a	A
Beta 2 –♀-29	25,82	0,90 tn	15,11tn	ST	A	45,00	ab	C	21,53	b	B	10,92	a	A
Beta 2(control)	22,62	0,87 tn	0,37 tn	ST	A	41,33	a	C	17,02	ab	B	9,52	a	A
Sari(control)	25,08	1,20 tn	-4,82 tn	ST	A	51,10	b	B	15,48	ab	A	8,67	a	A
Average	24,53					46,35			15,98			11,27		
BNT 5%						6,86								

Description: x̄ = mean, bi=regression coefficient, Sd² = deviation regression coefficient, S = stability, (A) = Adaptability, ST= Stable, TS, Unstable, A= Adaptive A-= Adaptive marginal land, A+= adaptive productive land.

The combination analysis of variance at three locations on the stover yield character (t ha^{-1}) showed the absolute results with a level of 1% at the location of 5,436.73, clone of 86.63 and GXE of 90.13. The high value of the clone of 5,436.73 explains that the real difference in the character of the sequence results (t ha^{-1}) is due to the influence of the test location. Based on (table 8), it can be seen that the BIS clones OP-61-♂-13, Beta 2 -♀-29, Beta 2 (control) and Sari (control) showed that the values of regression coefficients and regression deviations are not significantly different, so that all three were declared stable and adaptif. While the BIS OP-61-OP-37 clone has a regression coefficient value that is not significantly different and the regression deviation that is significantly different from the regression deviation value of >1, so it is categorized as an unstable clone with adaptation in a productive environment.

Differences in plant varieties also affect the yield of stover, this is because each variety has a different character. According to Azizah et.al., (2018) the results of stover between varieties are inseparable from the character of stem length and number of leaves. The number and size of the plant header will affect the weight of the plant. The more the number of leaves and the higher the plant, the weight of fresh stover will also increase (Indria, 2005). Another thing is also supported by Sianturi and Ernita (2014), if the results of stover is influenced by vegetative growth which results in the process of nutrient absorption. When the nutrients are not maximized, vegetative growth and development are not optimal. The productivity of the stover is the resultant of 3 processes including the accumulation of assimilate through photosynthesis, the decrease in asssimilate due to respiration and accumulation into tuber. The increase in dry weight of plants is due to increased leaf area to optimum and increased rate of photosynthesis.

As previously explained that this study used 5 quantitative characters consisting of number of tubers, the weight of the tubers, the weight of the stover, the yield of the tubers, and the yield of the stovers. Referring to these 5 characters to known level of stability and adaptability clones it can be a reference in the suitability of sweet potato planting land. In general, in the character of the number of tubers, it can be seen that BIS OP-61-OP-37 clone is stable and adaptive. Then on the characters of tuber weight, tuber yield and stover yield it was known that BIS OP-61-♂-13 and Beta 2-♀-29 were stable and adaptive. Clone BIS OP-61-OP-37 is a clone that has the highest yield of sweet potato in 3 locations, although it is not stable.

CONCLUSION

Clone BIS OP-61-OP-37 showed the highest average weight and yield of tubers at 3 locations, but was unstable and not adaptive. Clone BIS OP-61-♂-13 is a stable and adaptive clone with lower tuber yield BIS OP-61-OP-37.

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