



# The Role Corn Varieties on Biomass, Stomata and Chlorophyll on a Nutrient Stress

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**Abstract:** *This study conducted on Soil and Plant of Laboratory, Screen House Experimental Farms on 2016 July until December on Agricultural Faculty, Syiah Kuala University, Darussalam Banda Aceh, Indonesia. This study used a Randomized Completely Design (RCD) with 36 treatments and three replications. They are have two factors such as Varieties have 9 procedures, and nutrient stress have 4 treatments. The parameter was observed on biomass, a total of stomata and chlorophyll. The result showed that varieties and nutrient stress were significantly on biomass, the whole of stomata and chlorophyll. The best of biomass was found on Sri Kandi kuning, and the lowest was found on anoman 1. The best of a total of stomata was found on anoman 1 and the lowest was found on sukmaraja. The heavy of chlorophyll was found on bima and the lowest was found on anoman 1. The best biomass was found on the nutrient of stress in formula AB and the lowest was found on magnesium. The best stomata on nutrient stress were found on formula AB, and the lowest was found on magnesium. The heavy of chlorophyll on stress hara was found formula AB and the lowest was found on Kalium. The best combination on biomass was found Sri Kandi Kuning and formula AB, the lowest was found on anoman 1 dan magnesium. The best combination on stomata was found on gumarang and formula AB, dan the lowest was found on sukmaraja dan magnesium.*

**Keywords:** *corn; varieties; nutrient stress; biomass; stomata; chlorophyll*

## I. Introduction

Corn is necessary to increase of growth economic of Aceh. The market of largest and land are potential to consider, but the availability of soil is dry land such as Ultisol (BPS, 2015). Ultisol has characteristics of deficit of water and deficient nutrients. According to of Jaleel et al., 2009; Zang, 2007; Wang dan Sangguan, 2010; Aminian et al., 2011: deficiency of water and deficient nutrients can decrease that growth of root, leaf, a total of stomata, chlorophyll and biomass.

The research of Feng et al., (2013) deficiency of Phosphor, Kalium and Magnesium can be decreased on the tissue of plant which not perfect. The research of Devid et al., (2010) on corn which planted on dry land was revealed best respect if that plant availability of water. This problem can be controlled by using the best varieties—the purpose of the study to get the best types of corn on the tissue of a plant under nutrients stress.

## II. Materials and Method

### 2.1 Study of place

This research was investigated on Teureubeuh Village of Jantho Aceh Besar District of Indonesia. The temperature had 22-35 oC, elevation 100 sea levels. 05o17'05.2-95o35'12.1. The experiment of adaption on drought stress, K and Mg were observed at the laboratory of soil and plant, Screen House Experimental Farms Agricultural of Faculty, Syiah Kuala University Darussalam, Aceh, Indonesia from 2016 July until December.

### 2.2 Ultisol

As media planting used Ultisol on Teureubeuh Village of Jantho Aceh Besar District of

Indonesia. The analyze was reveals this soil has tecsturs tanah clay sandy loam, massa is 0,97-1,24 g m<sup>-3</sup>. Water pF 2,5 is 22,6-39,2%. pF 4,2 is 12,5-15,8%. Water of ability is 9,6-23,4%. Permeability is 24,0-4,14 cm/day. Porosity is 36,5-41,8%. Indec agregat is 34,1-36,7. pH H<sub>2</sub>O is 6,02-6.60. C organic only 0,32-1.79 while N totally is 0,11-0,20%. for P total only 6-10 Mgkg<sup>-1</sup>, K-total is 3-4 mg 100 g<sup>-1</sup> while P ability is 0,9-2,8 ppm. Ca is 1,54-4,75 Cmol kg<sup>-1</sup>. Mg is 0,67-0,81 Cmol kg<sup>-1</sup>. K is 0,10-0,20 Cmol kg<sup>-1</sup>. Na is 0,75-0,85 Cmol kg<sup>-1</sup>. capasity exchange cation are 3,13-6,59 Cmol kg<sup>-1</sup>. CEC is 20-26. acidity potensial on Al negative while H is negativ Cmol kg<sup>-1</sup>. EC 0,04 mscm<sup>-1</sup> Basa is 12-33%.

### 2.3 Corn

Varieties was used Anoman 1, Lamuru, Mortar, Gumarang, Srikandi Kuning, Sukmaraja, Bisma, Kresna, NK 212, NK jumbodan, Hibrida Bisi 12.

### 2.4 Nutrient Stress

Formula was used are mix formulasi A dan B. Kalium was gave on 1,8 g at 35 days (15 liter AB mix).

### 2.5 Analyze data

The research was used randomize completely design. Analyze data was used microsoft excel.

### 2.6 Para meter was observed

#### a. Density and Index stomata

Density and Index stomata were observed on 30 days and took that leaf which has opened the perfect, this used jangkar so that have a diameter 0,5 cm from 3 shoots, then fixation on alcohol 70 %, and then it's cleaned by equates, soaked on the formulation of HNO<sub>3</sub> 25 % on 20 times for damaged that tissue of mesofil than clean again by equates, than that undercut on a knife and soaked with bicycling on three times. And then that leaf put on preparation with glycerin 10 % and under microscope. Density and Index stomata were analyzed on rumus Lestari (2006) :

$$\text{Density of stomata (KS)} = \frac{\text{Total stomata}}{\text{Total observed}} \dots\dots\dots$$

$$\text{Index stomata (IS)} = \frac{\text{Total stomata}}{\text{total stomata + cel epidemisi}} \dots\dots\dots$$

#### b. Chlorophyll

Chlorophyll was analyzed on Food of Laboratory, and Chlorophyll was recovery after deficiency of water. This leaf took and weighed with scale 0,05 g, then added 2 mm acetone 80 %, then it is mashed up with a mortar and than homogenate was taking on 2 ml and entering on microfilter than centrifuge on 5.410 rpm on 20 detic for separate supernatant from a plant. Ekstraksi did more until has none colour. Supernatant Diptera 10 ml and was investigated with spectrophotometer on the length of gelombang 645 nm for chlorophyll A and B the range of gelombang 663 nm, chlorophyll A dan B by using this formulas :

$$\text{Chlorophyll A (mg/mg sample)} = \frac{(12,7 \times A_{663}) - (2,69 \times A_{645})}{\text{heavy sampel (mg)}} \times Fp \dots\dots\dots$$

$$\text{Chlorophyll B (mg/mg sample)} = \frac{((129 \times A_{645}) - (4,68 \times A_{663}))}{\text{heavy sampel (mg)}} \times Fp \dots\dots\dots$$

$$Fp (\text{factor formulation}) = \frac{10 \text{ ml} \times 1 \text{ liter}}{1000 \times W} \dots\dots\dots$$

$$\text{Chlorophyll total ( g/g tissue )} = 20,2 \times A_{645} \times 8,02 \times \frac{V}{1000 \times W1} \dots\dots\dots$$

C. Biomass was produce on biometric from roots under drought conditions x biomass on control.

Produce on average (MR) :

$$MR = (Y_s + Y_p) / 2 \dots\dots\dots$$

### III. Results and Discussion

#### 3.1 Varieties

Table 1 illustrated varieties was significantly on biomass, total of stomata and chlorophyll. The best biomass was found on srikandi kuning and the lowest was found on anoman 1. The total of stomata was found on anoman 1 and the lowest was found on sukmaraja. chlorophyll was found on bima and the lowest was found on anoman 1.

**Table 1.** Varieties on biomass on nutrient stress

treatment	L	-P	-K	-Mg	avarage (P)
V1	2.86	1.43	1.19	2.93	1.83
V2	5.97	3.17	3.76	3.50	4.30
V3	4.50	3.22	1.75	3.14	3.16
V4	11.49	2.52	4.18	2.87	6.06
V5	7.90	3.00	4.58	4.01	5.16
V6	5.81	3.36	4.84	2.13	4.67
V7	5.38	5.01	3.58	2.84	4.66
V8	2.48	2.11	2.59	1.39	2.39
V9	4.60	4.60	2.97	2.10	4.06
Average (U)	5.67	3.16	3.27	2.77	

On this result the observed on srikandi kuning was produce heavy biomasa than anoman 1. It's caused of srikandi kuning has a different of genetic than others. The research of Bukvice *et al.*, (2011) said the plan can be respect every varieties which has heavy of biomass it's.

While on total of stomata was found on anoman 1 are more heavy than sukmaraja, it's caused stomata on top leaf anoman 1 more opened than sukmaraja, besides that, it's caused 2 factor are availability of water and intensitas of sun which was received from leaf on anoman 1, so that on anoman 1 more availability suplay of sun than sukmaraja. Stomata can be opened or closed on every condition.

The research of Jezek *et al.*, (2015); Janmohammadi *et al.*, (2008) dan Kavari (2009) said the more of the total stomata whiches found on a leaf because that leaf is the more received sun which was that stomata could spread on sheet from best varieties.

As well as with chlorophyll, the more fertile will produce the better the plant, but chlorophyll only able on a plant which can be photosynthesis better. The research of Naghav *et al.*, (2013) said chlorophyll was decreased by water stress, so photosynthesis was damaged. If photosynthesis damage, it can produce the lowest. According to Rabbani *et al.*, (2011), photosynthesis are process physiology which has important on a plant which catches the sun and change chemistry than saved on carbohydrate.

#### 3.2 Nutrient Stress

Table 2 describes the nutrient stress was significantly on biomass, total stomata and chlorophyll. The best biomass was found on formulation AB, and the lowest was found on magnesium. The best stomata were found on formulation AB, and most moderate was found on magnesium. The best chlorophyll was found on formulation AB dan lowest was found on Kalium.

**Table 2.** Varieties on stomata on nutrient stress

treatment	L	-P	-K	-Mg	Average (P)
V1	219.00	222.67	93.33	101.00	178.33
V2	81.00	100.00	119.00	57.00	100.00
V3	253.67	136.33	135.00	116.67	175.00
V4	205.67	115.00	113.00	75.00	144.56
V5	71.67	95.00	125.00	70.67	97.22
V6	104.33	107.67	115.00	103.00	109.00
V7	250.67	127.00	100.33	95.00	159.33
V8	140.33	151.33	68.33	81.00	120.00
V9	190.67	72.67	64.00	105.00	109.11
Average(U)	168.56	125.30	103.67	89.37	

Magnesium (Mg) is a nutrient of mineral, which has essentially needed by using plant (Jezek et al., 2015). The role of magnesium will be necessary on photosynthesis such as atom central from others (Katerji et al., 2012; Cakmak et al., 2008). Deficiency Mg produces from more availability of cation, which has licking on soil sandy loam with the lowest capacity exchange cation (Ahmad et al., 2015; Gransee et al., 2013). It's all consequence of not balanced nutrient on soil and magnesium on fields. According to Cakmak dan Kirkby (2008). not stable of magnesium on fields can be decreased and deficiency of the nutrient.

The study of Cakmak and yazici (2010); Hardter et al., (2004), As well as deficiency of calcium, can produce the lowest of decreased of biomass, a total of stomata and chlorophyll. This research reveals the levels of nutrients was influencing on the ph of the soil.

### 3.3 Interaction

Table 3 showed substantial interaction on biomass, a total of stomata and chlorophyll. The best biomass was found on the combination between gumarang and formulation of AB dan the lowest was found on combination anoman 1 and kalium. The total of stomata was found on combination mortar, and formulation AB and the lowest was found on combination bisi 12 and kalium. The best chlorophyll was found on combination NK jumbodan dan P, and the lowest was found on combination lamuru dan -K.

**Table 3.** Varieties on cholorophil on nutrient stress

treatment	L	-P	-K	-Mg	Average (P)
V1	534.16	816.52	227.64	787.14	526.11
V2	1034.71	322.00	1107.95	825.09	821.55
V3	843.77	1185.74	1277.95	936.95	1102.48
V4	1240.15	885.87	825.73	1316.34	983.92
V5	1202.83	944.96	1256.50	921.14	1134.76
V6	1216.33	1166.25	1209.37	896.48	1197.32
V7	1237.66	713.87	811.47	997.51	921.00
V8	991.95	1199.34	1242.22	754.98	1144.50
V9	995.50	1445.29	304.52	1006.80	915.10
Avarage (U)	1033.01	964.43	918.15	938.05	

From result before the research, finding yet about best varieties of corn to control on condition of nutrient stress. This research is the first did of an experiment about nutrient stress on corn, which has done as a test to get the best varieties with adapted on drought condition.

#### IV. Conclusion

The result showed that varieties and nutrient stress were significantly on biomass, a total of stomata and chlorophyll. The best of biomass was found on Sri Kandi Kuning, and the lowest was found on anoman 1. The best of total of stomata was found on anoman 1 and the lowest was found on sukmaraja. The heavy of chlorophyll was found on bima and the lowest was found on anoman 1. The best biomasa was found on nutrient of stress in formula AB and the lowest was found on magnesium. The best stomata on nutrient stress were found on formula AB, and the lowest was found on magnesium. The heavy of chlorophyll on stress hara was found formula AB and the lowest was found on Kalium. The best combination on biomass was found Sri Kandi Kuning and formula AB, the lowest was found on anoman 1 dan magnesium. The best combination on stomata was found on gumarang and formula AB, dan the lowest was found on sukmaraja dan magnesium.

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