



## Zeolite and Urea Fertilizer in the Growth and Yield of Maize

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**ABSTRACT:** Karo district is the center of the corn crop in northern Sumatera. Farmers use inorganic fertilizer on top recommendation, is not good for the soil, plants, and costs. Zeolite, alumino silicate compound hydrated the main elements: alkali cations, alkaline soil and have the property of absorbing, separator, catalisator, fixing soil and the efficiently of Urea.

The purpose of this study were to understand zeolite, urea and interaction on the growth and yield of corn. The researchers use RAK factorial method, I zeolit: Z0 0 g/plot, Z1 105 g/plot, Z2 210 g/plot, Z3 315 g/plot. Z4 420 g/plot. II urea: U0 0 g/plant, U1 2,1 g/plant, U2 4,2 g/plant, U3 6,3 g/plant, U4 8,4 g/plant.

The result shows that real zeolite affect plant height, leaf area, production and weight of 100 seeds, not unlike the stem diameter, number of leaves, number of cob. Urea real effect on plan height, leaf area, and production but did not differ on stem diameter, number of leaves, dry weight of 100 seeds and cobs line. So zeolite are 315 (Z3) and Urea 6.3 g/crop (U3), interaction (Z3U3).

**Keywords:** Zeolite, Urea, Corn Crops.

### I. INTRODUCTION

Maize (*Zea Mays L.*) can be used for humans or animals life. In Indonesia, corn is the second staple food after rice. Meanwhile, the request for the staple food, maize is the third level after wheat and rice (anonymous, 2003). Benefits and uses of corn, are: food, animal feed and industrial raw materials. Nowadays, the use of maize increases. Almost all parts of corn could be used for various purposes, such animal feeds (stem and young leaves), firewood (stem and leaves), pulp or paper material (rod corn) and vegetables, cakes (the corn), also to replace coffee drink (Purwono, Purnamawati, 2007). In Karo, field of corn crops always continues in decades and consequently has a poor nutrient, farmers independence on inorganic fertilizers. The use of urea fertilizer to increase yields above recommendations, the pH of the soil in unstable. Plants need inorganic fertilizer with a dose of 450 kg/ha Urea, TSP and KCL each of 100 kg/ha. Anonymous (2006) showed the results of zeolite in Simangumban, North Tapanuli, are the type of Zeolite klinoptilolit. The results of calculations have made proposals that the number of 3.340.000 tons. Simangumban zeolite has better quality so that the zeolite can be used in the fertilizer industry, absorbing waste, and animal feed industries. The study is useful to increase production of maize, useful for testing zeolites to fix the land, and preserve fertilizer to reduce the use of urea, reduce production costs and increase the income of farmers and plant resistance to the volcanic ash of Mount Sinabung. The focus of this study was know the zeolite, urea fertilizer and the best interaction on growth and yield of corn. The hypothesis of this study are no response of zeolite, urea and the interaction between the zeolite with urea fertilizer on the growth and yield of corn. This study was helpful for the researchers for writing articles in journals, books, seminar materials, community service.

### II. MATERIALS AND METHODS

The research was conducted in Pergendangen Village in Sub district of Tiga Binanga in Karo district of North Sumatra. February to September 2016 a height of 500 meters above sea level flat topography, soil and osol and pH 5.69.

**Ingredients:** plant seeds of hybrid maize NK 22, zeolite, inorganic fertilizers Urea, TSP 100 kg / ha, KCl. 100 kg / ha, Water.

**Tools:** hoes and rakes, yells, meter, scliper, scales, handsprayer, plywood for nameplate, raffia, bamboo, saws, machetes, scissors and stationeries.

**Research methods:** Factorial RAK 2 factors: 1) the zeolite: Z0 0 kg / plot (control), Z1 105 g / plot, Z2 210 g / plot, Z3 315 g / plot, Z4 420 g / plot. 2) urea: U0 0 g / plant (control), U1 2.1 g / plant, U2 4.2 g / plant, U3 6.3 g / plant, U4 8.4 g / plant. Treatment of 25 combinations, three replications of 50 plants / plot, 5 plant

samples / plot, spacing of 70 cm x 30 cm, a plot size of 300 cm x 350 cm, 50 cm distance between the plots, 100 cm distance between replications / block, land area 1087.5 meters, the number of whole plant 11,250 plants.

**Implementation Research:** Land cleared of weeds and other plant debris, mixed with a tractor and then raked into a flat surface so that the continued manufacture of plot size of 300 cm x 350 cm high and 25 cm plot entirely 75 plot.

**Zeolites Award,** given once after completion of making plot, sown evenly over the plot one week before planting appropriate dose of study treatment.

**Urea treatment,** given twice, first awarded after a three-week-old plants (21) days after transplanting (DAT) and the second 6 weeks old (42) days after planting, fertilizer sown a distance of 7 cm and 10 cm from the plant, according to the dosage of the study.

**Giving Fertilizer TSP and KCl.** TSP and KCl respectively 100 kg / ha applied twice, along with urea.

**Seed Corn Planting and Harvest.** Seeds were planted two seeds of the holes, drill depth of 5 cm, covered with soil, harvested the life of 133 days after planting. The characteristics light brown, dry, seeds are shiny, black marks (black layer) base seeds and pressed with the nails do not cause scars.

**Maintenance.** Stitching is done one week of age after planting, watering is done if it does not rain, morning or afternoon. Weeding to control weeds. Pest and Disease Control carried out if there are symptoms of an attack.

**Observation parameters.** 5 plant samples / plot: Plant height (cm), stem diameter (cm), number of leaves (leaf), leaf area (cm), cob diameter (cm), cob length (cm), number of rows per ear (line), heavy cob gross / sample (g), the weight of cobs gross / plot (kg), heavy cob clean / sample (g), the weight of cob clean / plot (kg), heavy pipil / sample (g), the weight pipil / plot (kg ) and weight of 100 dry beans.

### III. RESULTS

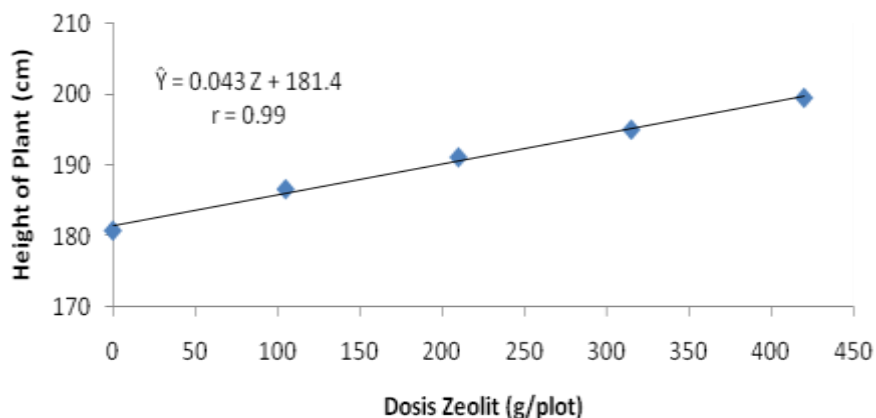
Plant height, height growth observed age of 56 days after transplanting (DAT) in Table 1.

Table 1. Average High Plant, Diameter, Number of Leaves and Leaf Area of Influence of Zeolite Addition on Maize age 56 hst

Treatment	Plant Height	Diameter of Rod (cm)	Number of Leaves	Leaf Area (cm)
<b>Zo</b>	<b>180.77 c</b>	3.42 a	14.14 a	2308.35 c
<b>Z1</b>	<b>186.60 bc</b>	3.38 a	13.91 a	2437.69 bc
<b>Z2</b>	<b>191.09 abc</b>	3.38 a	13.86 a	2529.99 ab
<b>Z3</b>	<b>194.99 ab</b>	3.45 a	13.88 a	2595.71 ab
<b>Z4</b>	<b>199.47 a</b>	3.47 a	13.92 a	2686.22 a
Uo	182.09 c	3.41 a	13.75 a	2300.72 c
U1	185.79 bc	3.38 a	13.85 a	2481.79 bc
U2	188.65 abc	3.48 a	14.07 a	2510.98 ab
U3	196.21 ab	3.41 a	14.02 a	2602.66 ab
U4	200.18 a	3.42 a	14.02 a	2661.80 a

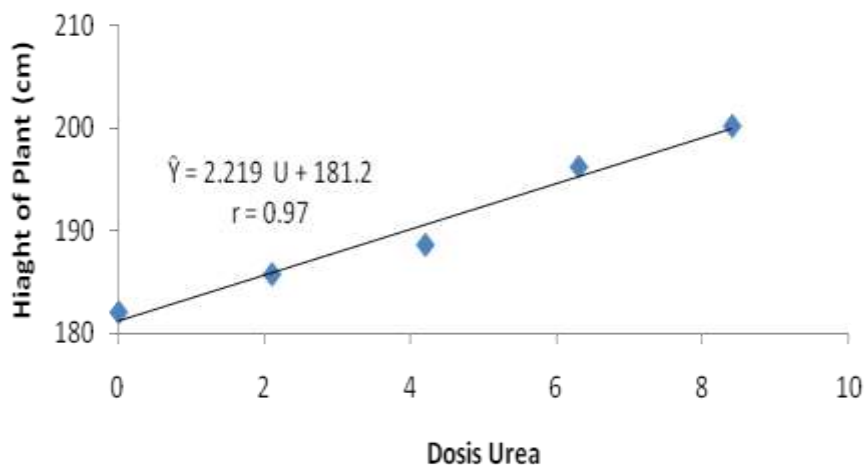
**Specification:** Notation same letters in the same column showed no significant effect on the level of 5% (lowercase) in the Duncan Multiple Test.

Age 56 different real hst. Age 56 hst zeolite 420 g / plot (Z4), the highest average of 199.47cm, zeolite 315 g / plot (Z3) average height of 194.99 cm, a dose of 210 g / plot (Z2) average height of an average of 191.09 cm, three different unreal. Zo average of 180.77 cm, zeolite 105 g / plot (Z1) an average of 186.60 cm higher with Zo, where Zo and Z1 to Z4 significantly different. Giving suggestions zeolite 56 hst 210 g / plot (Z2). Statistical analysis of the higher plant zeolite increasingly high response, (Figure 1).



Picture 1. the Affect of doses of Zeolite on the growth the height of maize 56 hst

Urea age 56 hst real difference. Age 56 hst dose of Urea 8.4 g / plant (U4), the highest average of 200.18 cm, no significant effect on the dose of Urea U3 and U2. Urea doses of 6.3 g / plant (U3) average height of 196.21 cm, dosage of 4.2 g / plant (U2) average height of 188.65 cm, the three were not significant ( $p > 0.05$ ). Uo lowest average 182.09 cm, and the higher dose of 2.1 g / plant (U1) 185.79 cm, where uo and significantly different U1 to U4. Urea 56 hst recommendation 4.2 g / plant, statistical analysis the higher dose of urea is used in response to plant height, (Figure 2).



Picture 2. the affect of using doses of Urea to the growth. height of plant 56 hst

### Diameter

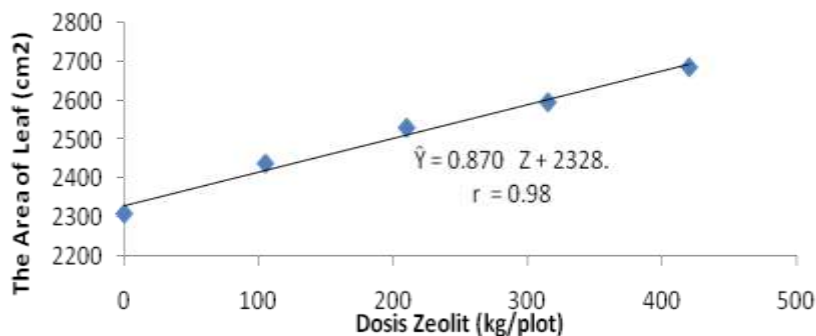
Plant stem diameter 56 HST average results in Table 1. The average age of 56 hst not significant. Age 56 hst zeolite 420 g / plot (Z4), the highest average of 3:47 cm, zeolite 315 g / plot (Z3) 3:45 cm, (Z2) 210 g / plot average of 3:38 cm to the smallest dose without zeolite average diameter 3:42 cm in which five different treatment is not. Urea age 56 hst analysis results not statistically different. Age 56 hst urea 8.4 g / plant (U4) Highest average diameter 3:42 cm, no significant effect of all doses of Urea (U3, U2, U1 and Uo). The lowest average Uo 3:41 cm, a low dose of Urea 2.1 g / plant (U1) diameter rod with UO higher on average at U1 at 3:38 cm, where Uo, U1, U2, U3 and U4 not significant.

### Number of leaves

Giving zeolite and urea plant leaf number dap age of 56 on average in Table 1. The number of leaves 56 days after planting, not significant. 56 hst seen that the zeolite 420 g / plot (Z4) up without Zeolite (Zo) is almost the same between 13.92 until 14:14 strands, the second level of treatment no significant difference. Urea 56 hst no significant statistical analysis. Age 56 hst without urea (Uo) to urea 8.3 kg / plant (U4) approximately equal to the number of leaves on average between 13.75 until 14:02 strands.

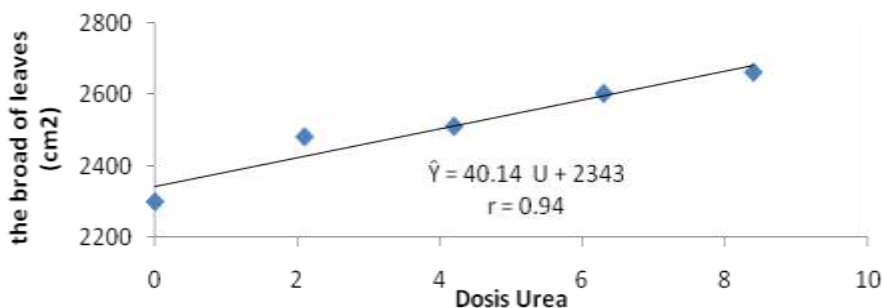
### Leaf Size

Data zeolite and urea leaf area 56 HST observations of the average in Table 1. Giving zeolite real difference at 56 days after planting. Age 56 hst zeolite 420 g / plot (Z4) widest average 2686.22 cm<sup>2</sup>, zeolite 315 g / plot (Z3) leaf area 2595.71 cm<sup>2</sup>, a dose of 210 g / plot (Z2) average area of 2595.99 cm<sup>2</sup>, three had no significant, (Zo) leaf area smallest average 2308.35 cm<sup>2</sup>, 105 kg zeolite / plots (Z1) is more spacious with Zo average Z1 2437.69 cm<sup>2</sup>, where Zo and Z1 had no significant but significantly different to the Z4. Award zeolite 56 hst recommendation is 210 g / plot (Z2). The statistical analysis the higher dose of zeolite is given in response to broad leaf, picture 3.



Gambar 3. the doses effect of zeolite to the area of leaves 56 hst

Age 56 hst real difference. 56 hst urea 8.4 g / plant (U4) the widest average 2661.80 cm<sup>2</sup>, no significant effect on urea lower U3, treatment of urea 6.3 g / plant (U3) leaf area average 2602.66 cm<sup>2</sup>, a dose of 4.2 g / plant (U2) on average 2510.98 cm<sup>2</sup>, the three were not significant. Urea (Uo) leaf area smallest average 2300.72 cm<sup>2</sup> dose of urea low with 2.1 g / plant (U1) leaf area higher value Uo on average at U1 at 2481.79 cm<sup>2</sup>, where Uo and U1 significantly different with U4, but U1 no significant effect on U2 and U3. Urea doses of leaf area 56 hst recommendation 4.2 g / plant, statistical analysis the higher dose of urea respond leaf area, picture 4.



picture 4. the doses effect of zeolite to the broad of leaves 56 hst

**Cob Diameter, Length and Number of Rows/Cob**

Results Award zeolite and urea were different on the cob diameter and number of rows per ear when harvested in Table 2.

Table 2. Average Diameter Cob, Cob Length and Number of Rows / sample From the effect of addition of zeolite and Urea on Corn							
Treatment	Diameter of cob cm	Length of cob cm	J.B/cob	Net Weight of Cob/sample(g)	Bruto weight/pl ot (kg)	Net weight of cob /sample(kg)	Net weight of cob/plot(kg)
Zo	4.45 a	18.57 c	14.27 a	203.32 c	10.01 c	186.84 c	9.39 d
Z1	4.52 a	18.98 c	14.49 a	209.87 bc	10.50 c	192.16 c	9.64 cd
Z2	4.64 a	19.45 bc	14.77 a	217.35 abc	10.86 bc	200.33 bc	10.05 bc
Z3	4.73 a	20.12 ab	15.29 a	223.78 ab	11.18 ab	207.59 ab	10.41 ab
Z4	4.88 a	20.88 ab	15.25 a	231.36 a	11.57 a	211.83 a	10.62 a
Uo	4.45 a	18.67 c	14.40 a	205.74 c	9.96 d	188.39 d	9.43 d
U1	4.63 a	19.29 bc	14.59 a	212.59 bc	10.62 cd	194.65 cd	9.73 cd
U2	4.65 a	19.45 abc	14.72 a	217.10 abc	10.86 bc	198.78 bc	9.94 bc

U3	4.73 a	20.00 ab	15.12 a	223.56 ab	11.19 ab	206.04 ab	10.31 ab
U4	4.76 a	20.60 a	15.25 a	226.69 a	11.50 a	210.90 a	10.71 a

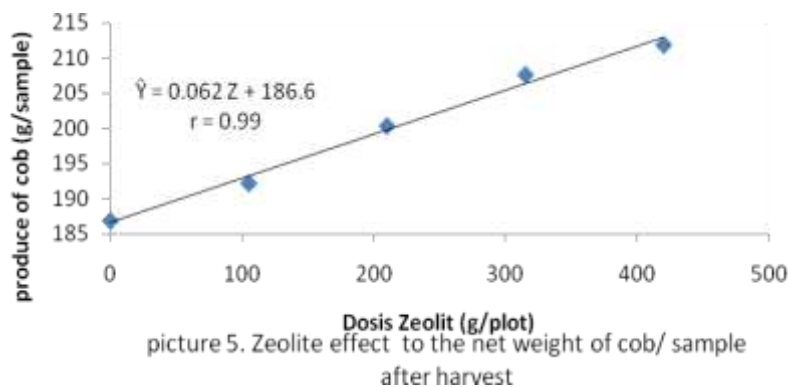
Specification Notation same letters in the same column showed no significant effect on the level of 5% (lowercase) in the Duncan Multiple Test.

**Table 2** zeolite no real influence cob diameter, Z4 highest average of 4.88 cm, without zeolite (Zo) is lower on average 4:45 cm. Urea application no real influence cob diameter, high dose of 8.4 g / plant (U4) diameter highest tongol an average of 4.76 cm control (Uo) the lowest average of 4:45 cm. Cob length (Table 2) zeolite real influence cob length, the average highest zeolite Z4 20.88 cm no significant effect on the lowest dose of 315 g zeolite / plots (Z3) on average 20:12 cm and Z2 average of 19.45 cm but treatment significantly different Z4 Z1 and Zo. Without Zeolite (Zo) long on average the shortest cob 18:57 cm not significantly different from the Z1 and Z2 but significantly different to the Z3 and Z4. The urea different doses of real influence cob length dirty/sample. Table 2 high dose of 8.4 g / plant (U4) long on average the highest cob is 20.60 cm compared with controls (Uo) cob length slightly shorter with an average of 18.67 cm. Table 2 zeolite effect no significant effect on the number of rows/ear, Z4 highest number of rows/cob average of 15:25 of lines, but without Zeolite (Zo) the number of rows/ear lowest average line 14:27. Urea dose effect no significant effect on the number of rows/ear, but the dose of 8.4 g/plant (U4) the number of lines more average 15.25 compared to the control line (Uo) 14.40 lowest average line.

**Cob Gross and Net Weight (g/samples and kg/plot)**

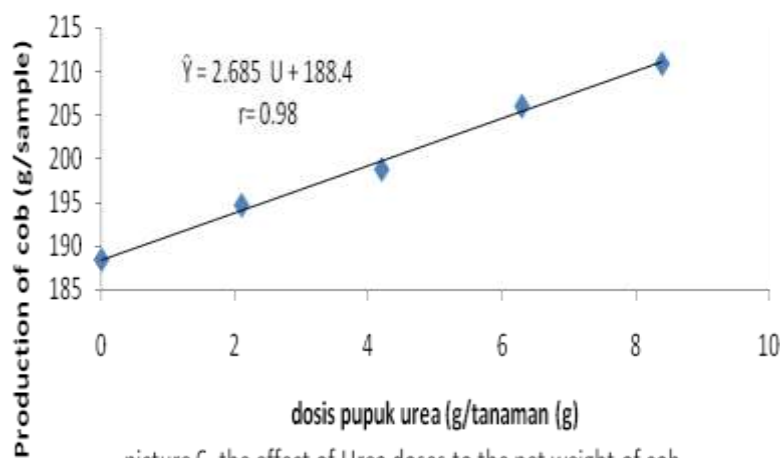
The results of weighing the influence of zeolite and doses of urea on the cob gross weight/ sample, cob weight gross/plot cob, cob net weight/weight of sample and cob clean/plot at harvest time are presented in Table 2. Table 2, zeolite real impact on the gross production / sample (of corn cobs and husks), that zeolite 420 g/plot (Z4) cob dirty corn/highest sample average of 231.36 g, whereas without zeolite (Zo) the gross income of the lowest average -rata 203.32 g significantly different from Z3 and Z4. Zeolites Award cob weight gross/samples of the recommended 210 g/sample (Z2) with a gross weight 217.35 g, because it is not significantly different from Z3 and Z4. Significant effect on the urea dose cob gross weight/sample. Table 2 gross weight/highest sample average of 226.69 g 8.4 g/plant (U4), not significantly different from 6.3 g/plant and 4.2 g/ plant (U3 and U2) 223.56 g/samples and 217.10 g/sample, so that the use of urea at a dose of 4.2 g/ plant is the recommended dose. Treatment Uo generate gross weight of the lowest average of 205.74 g/sample.

Table 2. real influence cob gross weight/plot, zeolite 420 g/plot (Z4) gross weight/plot average high 11:57 kg/plot had no significant (Z3) 315 g/plot gross weight/plot average 11:18 kg/ plot. Zeolite (Zo) with the lowest gross weight on average 10:01 kg/plot, no significant effect on Z1 and Z2, but significantly different Z3 and Z4. Urea significant effect on the gross weight of cobs/plot. Table 2, gross weight/plot highest average 11:50 kg/plot urea (U4) 8.4 g/plant, but no significant effect on urea (U3) 6.3 g/plant produces gross weight on average 11:19 kg/plot doses urea proper maize. Uo (without urea) weight lowest gross average of 9.96 kg/plot no significant effect on the recommended dose of 2.1 g/plant (U1). Weight cob clean/samples (Table 2) zeolite significant effect on the net weight/sample. Zeolite 420 g/plot (Z4), the highest average of 211.83 g/net weight of the sample no significant effect on the zeolite 315 g/plot (Z3) averaging 207.59 g/samples net weight but significantly different from Z2, Z1 and Zo. Without Zeolite (Zo) the net result/sample lowest average 186.84 g/ sample did not differ significantly on Z1 and Z2 but significantly different to the Z3 and Z4. Effect of zeolite on the cleaner production / sample on picture 5.



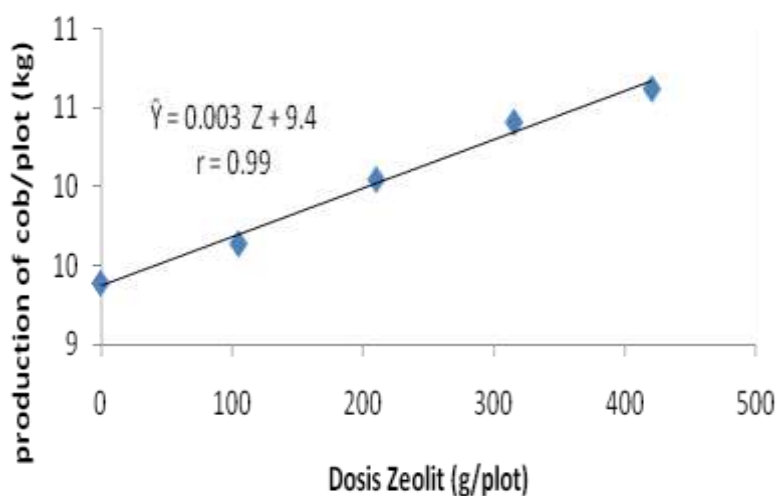
Significant effect on the urea dose cob net weight/sample. A dose of 8.4 g/plant (U4) the net result/highest sample average of 210.90 g/sample compared to the U3 (6.3 g/plant) lower yields an average of 206.04 g/sample had no significant but significantly different with U2, U1 and uo. The net result/lowest sample

without urea (U<sub>0</sub>) averaging 188.38 g/samples and no significant effect on the U<sub>1</sub> generate net weight/samples averaging 194.65 g. Can be seen in picture 6.



picture 6. the effect of Urea doses to the net weight of cob /sample of corn

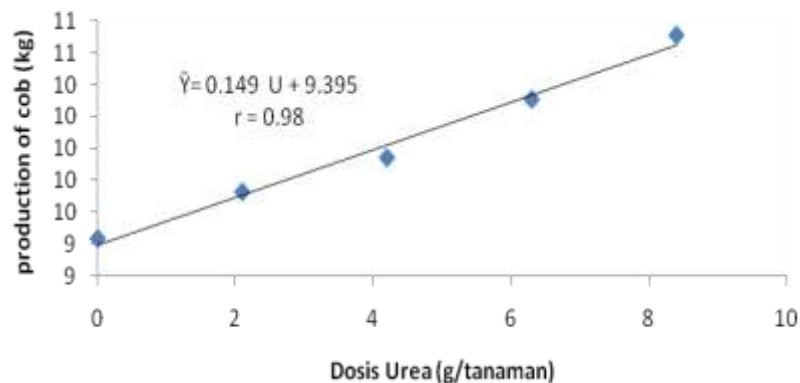
Table 2. Giving different zeolites significant net cob weight/plot. Z<sub>4</sub> zeolite (420 g/plot) cob net weight/plot highest average 10.62 kg, compared with 315 g/plot Zeolite (Z<sub>3</sub>) net/plot lower average 10:41 g/plot but not significant. Z<sub>3</sub> (315 g/plot) zeolite appropriate dose maize. Zeolite (Z<sub>0</sub>) cob clean/plot lowest average of 9:39 kg/plot no significant effect on the Z<sub>1</sub> with the net result/plot average of 9.64 kg. Zeolites against cob clean production/plot on picture 7.



Picture 7. the effect of zeolite given on the net result of cob/plot (kg)

Urea real influence on weight cob clean/plot, a high dose of 8.4 g/plant (U<sub>4</sub>) net weight average of 11.71 kg/plot no significant urea 6.3 g/plant (U<sub>3</sub>) is lower on average 10:31 kg net weight/plot. U<sub>3</sub> is the use of appropriate (recommended). (U<sub>0</sub>) net weight/plot the lowest average of 9:43 kg no significant effect on the urea 2.1 g/plant (U<sub>1</sub>) average of 9.73 kg/plot, urea dose relationship to the production of clean cob/plot, picture 8.





Picture 8. the effect of Urea doses to the cob/plot (kg)

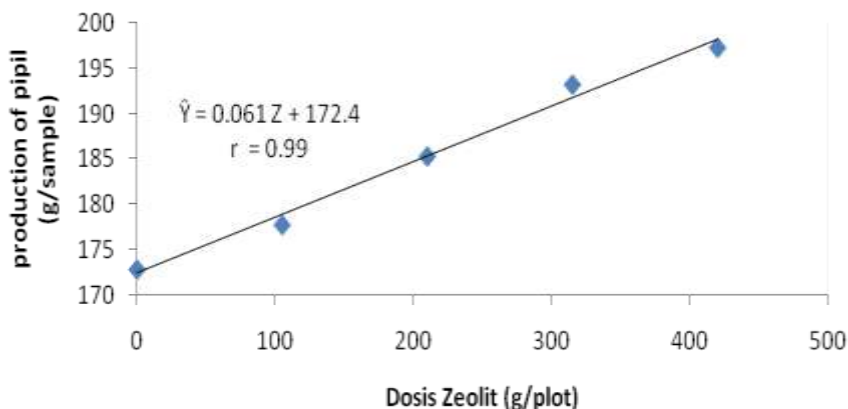
**Pipil Weight (g/sample, kg/plot) and weight of 100 seeds (g)**

Given of zeolite and urea to the dried corn differently to dry pipil results in both production /sampling and production/plot showed significant differences and a weight of 100 dry seeds, but no significant effect due to the use of urea to the weight of 100 dry seeds which each outcome the mean average presented in Table 3.

Table 3. Average net result pipil/sample (g), the results pipil/plot (kg) and weight of 100 seeds pipil dose effect of Zeolites and Urea.

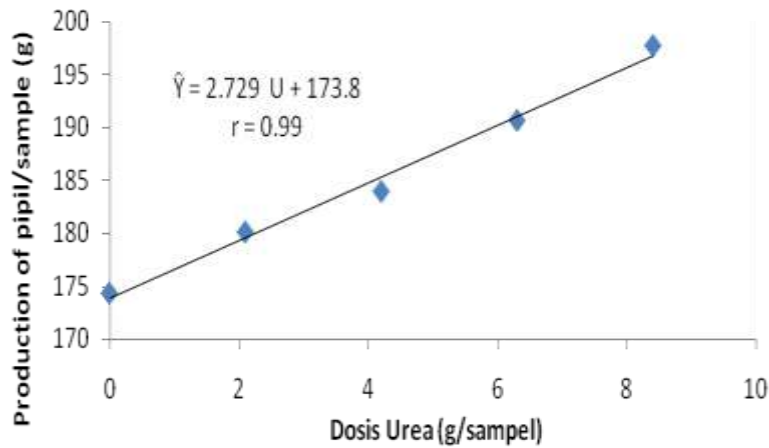
Treatment	Weight of pipil/sample (g)	Notation 0.05	Weight of pipil/sample (kg)	Notation 0.05	Weight 100 seeds (g)	Nottion 0.05
Zo	172.83	d	8.57	Cc	32.34	b
Z1	177.75	cd	8.89	Cc	32.84	b
Z2	185.31	bc	9.27	Bcbc	33.71	ab
Z3	193.23	ab	9.66	Abab	34.38	ab
Z4	197.30	a	9.93	a	35.44	a
Uo	174.26	d	8.65	Dd	32.24	a
U1	180.05	cd	9.00	Cded	33.55	a
U2	183.87	bc	9.19	Bcbe	33.97	a
U3	190.58	ab	9.53	Abab	34.27	a
U4	197.65	a	9.95	Aa	34.68	a

Specification Notation same letters in the same column showed no significant effect on the level of 5% (lowercase) in the DMRT Test. Table 3 shows the zeolite real influence on the production of clean pipil/sample, a zeolite 420 g/plot (Z4) generate pipil/highest sample average of 197.30 g/sample had no significant Zeolite 315 g/plot (Z3) lower production average -rata 193.23 g/sample, Zo produce pipil lowest average of 172.83 g/sample no significant effect on Z1 while the Z2, Z3 and Z4 significantly different (p < 0.05). Zeolites response to the production pipil/sample pictures 9.



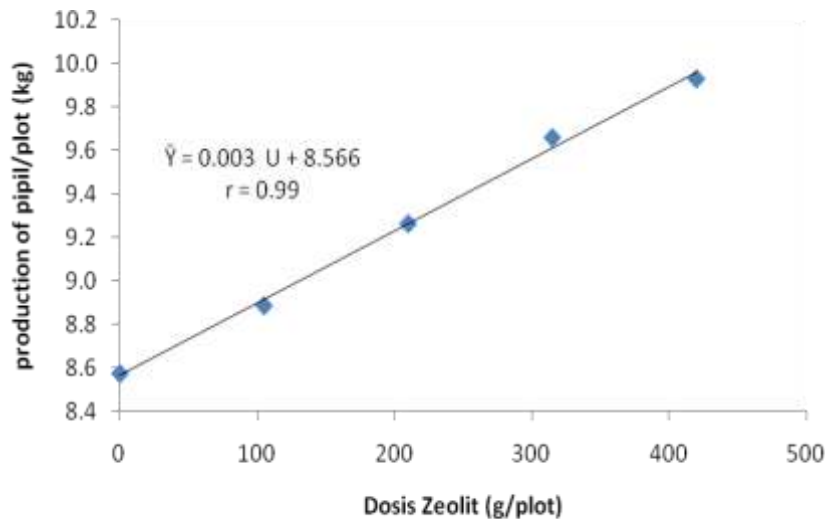
Picture 9. the effect doses of Zeolit to the weight of pipil/sample

Different doses of urea significant effect on the net weight pipil/sample. Table 3 weight pipil net/highest sample average of 197.65 g/sample of urea highest with 8.4 g/plant, was not significantly different with urea lower by 6.3 g/plant (U3) averaging 190.58 g/sample, urea dose of 6.3 g/plant is recommended. Net weight uo pipil lowest average 174.26 g/sample, significantly different to the treatment U2, U3 and U4. The response to the production of urea pipil/sample can be seen in picture 10.



Picture 10. the doses effect of Urea on the result of pipil/sample (g)

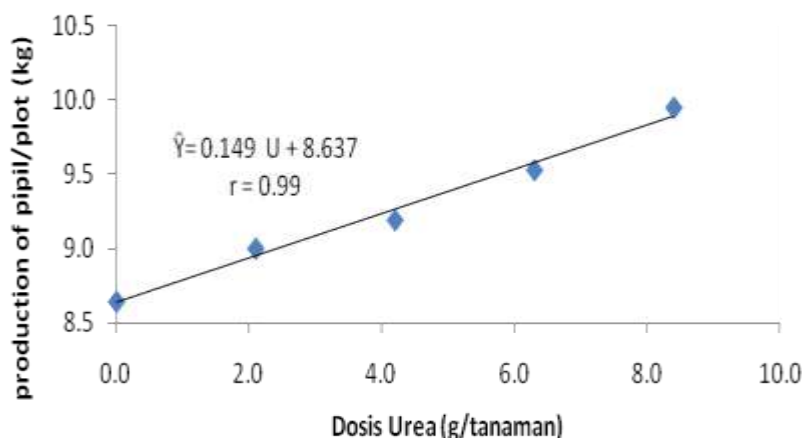
Table 3 shows the zeolite real impact on the net result pipil/plot, giving zeolite 420 g/plot (Z4) generate production pipil / plot highest average of 9.93 kg / plot no significant effect on 315 g / plot (Z3) weight pipil / plot the average 9.66 kg / plot and the use of zeolites are suggested, without zeolite (Zo) heavy lowest average pipil 8:57 kg / plot, no significant effect on Z1 and Z2. Provision of zeolite to the production pipil / plot shown in picture 11.



picture 11. The doses effect of zeolite Zeolit on the result of pipil/plot (kg)

Urea real response to the net weight pipil / plot. (Table 3) heavy pipil / highest plots average 9.95 kg / plot urea 8.4 g / plant (U4), but no significant lower 6.3 g / plant (U3) average weight pipil 9:53 kg / plot. Uo weight pipil / plot lowest average 8.65 kg / plot no significant 2.1 g / plant (U1) the average weight of pipil 9:00 kg / plot, significantly different with U2, U3 and U4. Urea response results pipil/plot picture 12.





Picture 12. The doses effect of Urea on the result of pipil/plot (kg)

Weighing 100 dry corn kernels (Table 3) zeolite real impact. Zeolites high dose of 420 g / plot (Z4) weight 100 dry beans the highest average of 35.44 g no significant effect with lower doses at 315 g / plot (Z3) averaging 34.38 g, and 210 g / plot (Z2) Average -rata 33.71 g and but significantly different to the Z1 and Zo. (Zo) weighing 100 grains lowest average 32.34 g no significant effect on the Z1, but significantly different on the Z2, Z3 and Z4. Urea (Table 3) the response was not significantly affected net production pipil. Giving a dose of 8.4 g / plant (U4) high dose to the weight of 100 seeds slightly higher average of 34.68 g whereas without Urea (Uo) gave the lowest weight of 100 grains with an average of 32.24 g. The results of the analysis that was significantly different interactions against the weight of zeolite and urea pipil / samples, heavy pipil / plot and a weight of 100 grains of dry corn. Produce seeds most appropriate zeolite 315 g / plot with 6.3 g / urea plant (Z3U3)

#### IV. DISCUSSION

##### Effect of Zeolite on Growth and Yield of Corn.

The average yield of each parameter zeolite real influence on the growth and yield of corn. Zeolite different doses significantly different effect on height, leaf area, yield per plant and yield per plot. But the differences are not significant on the number of leaves, stem diameter and the diameter of the cob. The corn crop vegetative growth period is in need of Nitrogen supply in large quantities for the formation of biomass (Agustina, 1990). Corn crop yield in the form of seeds, provision of appropriate zeolite using 315 g / plot of 300 kg / ha, according to the research results Widyanto et al. (2013) high production and a recommended dosage for corn growth and yield of 300 kg / ha.

Zeolites land reform is applied in response to land on the growth and production. Zeolites are a group of aluminosilicate compound hydrated main elements consist of: alkali cations, alkaline earth, has properties as an absorbent, a separator and a catalyst. In agriculture, zeolite is used as an absorbent, ion exchangers and reventing of soil fertilizer efficiency and lead to increased production (Anonymous, 2011). Giving Zeolite one of the factors increasing plant growth and production. Nutrient availability can be improved planting progress and results that their response to nutrient uptake by plant roots which can promote the growth and yield with increased concentrations of fertilizers applied on corn. The low zeolite supplied to the plant nutrients in the soil resulted into low will result in poor growth and development of plants once lowered maize production, especially compared to the higher concentration of fertilizer (Sitorus, 2008). Zeolites have a very high CEC. This is because the zeolite has a cavity that relate to one another, which is empty channels in all directions in which there are ions are easily confused (Hafsah, 1999). The use of zeolites can improve efficiency and reduce the damage will fertilization intensity excessive watering. This is due zeolite able to absorb nutrients and distribute them back and it maintains the humidity in a longer time (Swardi and Karjono, 1991).

##### Effect of dose of Urea on Growth and Yield of Corn

Statistical analysis of each parameter urea real influence on the growth and yield of corn. Parameters real difference is the plant height, stem diameter, gross and net production per plant and per plot sample, also significantly different with production pipil / or samples per plot. The higher the urea fertilizer given to plants would provide a stimulus to the growth and production of corn, this is due to the growth of plants in the vegetative growth period is in need of supply of nitrogen in large quantities for the formation of biomass (Agustina, 1990). Results of the corn crop in seed research results accurately using 6.3 g / plant (150 kg / ha),

according to the results of research Widyanto et al, (2013) that the growth and production of high and this is the recommended dose for corn growth and yield of 150 kg / ha. Based on the higher dose of urea fertilizer given to plants is the availability of the growth, in accordance with the opinion of Sutedjo (2002) states on nutrient needs for each different growth stages (foth, H. D. 1991; Sitorus, 2008). Addition of Urea be an addition of nitrogen as an additional Ammonium ions and some carbohydrates to experience the synthesis in the leaves and converted into amino acids, especially so in the green leaves into wide as a result makes the process of photosynthesis is higher (Mas'ud (1993).

### **Interaction Effect of Zeolite and Urea on Growth and Yield of Corn.**

The results of the analysis of variance there is no interaction were significantly different between the treatment dose of zeolite and urea on all parameters observed. Giving zeolite and urea on maize growth and no significant results, that the zeolites can reduce the use of urea, but both factors are then applied to the plants support each other. At doses of zeolite and urea did not show significant differences. With the addition of zeolite and urea dose capable of overcoming nutrient needs of plants. Formation on roots of corn plants supported by enough of the nutrient content in the soil. By sufficient nutrient availability in soil at the plant followed by production growth and higher. Samadi (1997), states that the ammonia necessary elements for the formation karbohidarat plant suffered synthesis in the leaves and processed into amino acids. Interactions were not significant is due to that when one of the influential factors are stronger than other factors, the influence of these factors is covered and when each of these factors have extremely different properties influence and the nature of the work it produces relationships that influence is not real in favor of a growth plant (Poerwoidodo, 1992).

Furthermore, Judge (1986), states that the growth of the plant would be better if the factors affecting the growth of balanced and profitable. The other study was conducted by Winana, ES. et al, Repair of planting medium and growth through the application zolit where zeolites are known to improve soil fertility by increasing the cation exchange capacity (Dadang Gusyana, 2001). The results of the study Arief Widyanto, et al (2009) dose combination of zeolite 750 kg / ha of urea 50 kg / ha showed the best results on the leaf area, plant height and total dry matter / plant compared to the treatment of urea to 300 kg / ha without Award zeolite. Award zeolite dose of 500 kg / ha can increase the yield of crops without giving cob than zeolites. Sembiring and Tarin (2012) on the research results and showed that the zeolite and doses of organic fertilizers real effect on plant height, leaf area, production / sample production / plot. The best treatment is giving zeolite Z2 (945 g / plot) and urea A1 (42.22 g / plant).

## **V. CONCLUSION**

**Based on the analysis and the results of this study the researchers conclude as follows:**

- 1.** Zeolites effect significantly plant height, leaf area, production and weight of 100 seeds but no different to the diameter of the stem and leaves, to generate growth and production of high enough doses of 315 g / plot (Z3).
- 2.** Dose effect significantly the urea plant height, leaf area and production but did not differ on stem diameter, number of leaves and dry weight of 100 seeds, to get proper growth and production using doses 6.3 g / plant (U3).
- 3.** No significant difference was found on the interaction effects of the use of zeolites with urea on the growth and yield of corn, interaction for growth and good results using zeolite 315 g / plot and urea 6.3 g / plant (Z3U3).

### **Suggestion**

Results of analysis of zeolite recommended 315 g / plot (Z3) and urea 6.3 g / plant (U3) in low-lying areas and the need to do further research in the highlands and the different varieties in the provision of zeolite.

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