The correlation of variable affecting yield on anthocyanins corn

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Abstract. Variable importance under vegetative and generative stage for effecting of grain yield on anthocyanins corn. Simple correlation and regression analysis has been conducted between grain yield as dependent variable (yi) with all independent variable (xi, i:1,2,3, . . .,6) as vegetative and generative stage. Stepwise of multiple regression was be used for define of variable was more important to affecting of yield. The experiment were conducted in Maros and Bajeng experimental farm on rainy 2017, data has been collected as sample from 30 plants per se. Two blocks of experiment 17x25m were planting of with spacing 75x20 cm one plant per hole, length of plot 15 m. Fertilizer be applied with Urea-Ponska (300-200) kg/ha. Anthocyanin’s corn held to increase of human health. The origin of anthocyanins corn is from Mesoamerica it is a pigment that give color of purple to black may affect to anticipated of viral (virus), cholesterol, heart disease, obesity, and cancer. The result multiple regression shown that variable which is be increase of yield and significant different founded in Maros were plant height (x1), water content of seeds (x2), and ear height. (x5). Model: y:3.404+0.027x1+0.018x2-0.073x5, R^2:0.645. In Bajeng shown that water content of seeds (x5), number of seeds per cob (x7), and 1000 seeds (x8), Model was yi=4.096-1.776x5+0.087x7+0.023x8; R^2:0.92. In The two-location yield, be decrease if water content of seed was increase.

1. Introduction

Yield performance of anthocyanins corn is a product of several characters and usually measured simultaneous and their association with provide useful information, how the characters as variable influenced yield response. Anthocyanins corn held to increase of human health. The origin corn is from Mesoamerica it is a pigment that give color of purple to black may affect to anticipated of viral (virus), cholesterol, heart disease, obesity, and cancer [1]. This study to find out of variable which is affecting the yield, has been analysis. by stepwise to selected independent variable to used Microstat software [2,3]. Data would be generated for grain yield as dependent variable (yi) and vegetative-generative were independent variable (xi). Selected families were importance for define standard to increasing cycle of population (ci+1) by recombination between families selected. The additive model yi:f(xi), i:1,2,3, . . ..n which be assume ei ~N(µ,σ^2) [4]. Stepwise analysis would be applying with involving more than one independent variable is operating to involve the estimation and test of significant by (k+1), k: no of data to observe. The step independent variable was inside in model by standard of highly coefficient correlated with the response to grain yield, and continuing by select to
using highest the partial correlation [4-6], conducted by stepwise analysis for selected two variable in to forecast of fish landing and selected of agronomic character.

The objectives of experiment was to find out of variable which is dominant to affecting the grain yield of anthocyanins corn in two locations. Variable would be selected by procedure of stepwise analysis.

2. Material and methods

The research has been conducted in Maros and Bajeng experimental farm on rainy 2017. Variety be planting was Srikandi Ungu 1. Two block were preparing in land area 30x17 m² for growing plants. Spacing 75x20 cm one plant per se, fertilizer be applied Urea-Ponska (300-200) kg/ha and weeding was be frequently to founded of maximal yield. Plants sample be recorded by sampling techniques square block in diagonal lines, and yielded converted by CIMMYT methods:

\[ Y = \left( \frac{10000}{\text{size sample}} \times (100 - wa) \right) \times \left[ \left( \text{weight cob harvested} \right) \times 0.85 \right] \]

wa = water content on harvested
0.85 = shelling percentage

Dependent variable was yi: grain yield in 15% wa and independent variable were x1 (plant height), x2 (ear height), x3 (silking period), x4 (shelling percentage), x5 (water content of seeds), x6 (no seeds per line), x7 (no lines per cob) and x8 (weight 1000 seeds). Data were collected and separate of Maros and Bajeng experimental farm.

Simple correlation by formula:

\[ r = \frac{\sum xy}{\sqrt{\left( \sum x^2 \right) \left( \sum y^2 \right)}} \]

Stepwise analysis was used by procedure of Draper and Smith (1966), and software with Microstat and modification of excel formula Program (Yasin and Mejaya, 2016).

Full model in matrix be write: \( Y = X\beta + \varepsilon \),

\( Y: (nx1) \) vector dependent variable, yield t/ha
\( X: (nxp) \) matrix independent variable, n:30, p:8
\( \beta: (px1) \) vector coefficient regression
\( \varepsilon: \) vector std and \(-\text{NID}(0, \sigma^2)\)

Coefficient of \( \beta \) was computed: \( \beta = (X'X)^{-1}X'Y \) and \( [X'X]^{-1}X'X = I \)

3. Result and Discussion

Means of yield as dependent variable (yi) in two locations is not significant difference, there are founded around 8.00-9.00 t/ha. The independent variable weight of 1000 seeds (x8) shown in Maros were more 7.6% than in Bajeng and standard deviation 15.0-17.7 gr. The simple correlation between variable to observed in Maros and Bajeng could be shown in symmetric matrix Table 2.

In table 2 could be shown that in Maros there are significant different to increase of yield of anthocyanin corn and be founded only in plant high (x1), grain would be increase on highest of plant. In Bajeng exp farm shown that significant difference founded on variable number of seeds per cob (x7) would be affected to increase of yield, but water content of seeds harvested (x5) affecting decrease of yielded if water content was increase [7]. Correlation between independent variable shown that no of seeds per cob (x7) was be increase of shelling percentage. Statistical test of simple coefficient was 0.361 (5%) and 0.463 (1%). The stepwise analysis in table 3 founded that in Maros there are three independent variables in regression model x1, x2 and x5, and significant different for increasing yield of anthocyanins corn.

Model under three independent was \( y:3.404 + 0.027x_1 + 0.018x_2 - 0.073x_5, R^2:0.645 \). Wang and Zhuo. (2016) that selected model could founded by high value coefficient of determination (R2). The first step which is variable could be inside of analysis was selected for predicted of dependent variable.
Table 1. The means and standard deviation of variable in two location, 2017

| Variable                | Maros          |       | Std | Bajeng         |       | Std |
|-------------------------|----------------|-------|-----|----------------|-------|-----|
| y (yield, t/ha)         | 8.47           | -0.97 | 0.97| 8.75           | -     | 1.23|
| x1 (plant height, cm)   | 200.83         | 0.027 | 10.35| 200.47         | 0.039 | 6.17|
| x2 (ear height, cm)     | 99.60          | 0.026 | 6.29 | 97.73          | 0.001 | 6.69|
| x3 (silking, days)      | 57.30          | 0.283 | 0.59 | 54.96          | -     | -   |
| x4 (shelling, %)        | 77.00          | -0.003| 2.81 | 78.14          | 0.020 | 2.42|
| x5 (water.content, %)   | 30.02          | -0.071| 2.28 | 29.97          | -0.161| 2.32|
| x6 (no.lines/cob)       | 13.26          | 0.096 | 1.34 | 13.46          | -     | -   |
| x7 (no.seeds/line)      | 32.93          | 0.078 | 4.81 | 31.73          | 0.096 | 4.53|
| x8 (weight 1000 seeds,gr)| 328.73        | -0.013| 17.7 | 305.16         | 0.021 | 15.06|
| Intercept (α)           | -              | -10.459| -   | -              | 2.888 | -   |

The result in Bajeng was founded same in Maros there are three independent variable were importance to yield component. The statistics model in three steps was founded: yi=4.096-1.776x5+0.087x7+0.023x8; R²:0.92. Previously, [8] founded four independent variables were highly significant in multiple regression by stepwise analysis under fourteen characters of white maize population from CIMMYT. White maize population in this experiment was from CIMMYT which is highly good adapted in Indonesia [9].

Table 2. Coefficient of simple correlation between all variable to observed

| Var  | y    | x1    | x2    | x3    | x4    | x5    | x6    | x7    | x8    |
|------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| Maros exp. farm |
| y    | 1.000 | 0.375 | 0.106 | -0.176| 0.056 | -0.285| -0.061| 0.222 | 0.011 |
| x1   | 1.000 | 0.667 | 0.086 | -0.294| 0.278 | -0.079| -0.531| 0.195 | -0.009|
| x2   |       | 1.000 |       |       | 0.263 | -0.198|       |       |       |
| x3   |       |       |       |       | 1.000 |       |       |       |       |
| x4   |       |       |       |       |       |       |       |       |       |
| x5   |       |       |       |       |       |       |       |       |       |
| x6   |       |       |       |       |       |       |       |       |       |
| x7   |       |       |       |       |       |       |       |       |       |
| x8   |       |       |       |       |       |       |       |       |       |
| Bajeng exp. farm |
| y    | 1.000 | 0.026 | 0.207 | -0.093| 0.177 | -0.442| -0.147| 0.428 | 0.185 |
| x1   | 1.000 | 0.244 | 0.010 | -0.108| 0.218 | -0.134| 0.249 | -0.325| 0.027 |
| x2   |       | 1.000 |       |       | 0.762 | -0.293| -0.100| 0.261 | 0.084 |
| x3   |       |       |       |       | -0.198| 0.094 | -0.043| 0.072 | 0.098 |
| x4   |       |       |       |       | 1.000 | -0.246| 0.096 | 0.483 | -0.008|
| x5   |       |       |       |       |       | 1.000 |       | -0.379| -0.171|
| x6   |       |       |       |       |       |       |       | -0.208| -0.030|
| x7   |       |       |       |       |       |       |       | 1.000 | -0.033|
| x8   |       |       |       |       |       |       |       |       | 1.000|

Level of significant: 0.361 (5%) and 0.463 (1%)
Table 3. The stepwise regression for selected independent variable

| Selected stage | βi     | Se    | F calc | Prob, |
|----------------|--------|-------|--------|-------|
| **Maros exp. Farm** |         |       |        |       |
| Step I, x1 ; $R^2 = 0.560$ |       |       |        |       |
| x1 (plant height, cm) | 0.604  | 0.015 | 6.29*  | 0.000 |
| α (intercept) | 0.039  | -     | -      | -     |
| Step II, x5 ; $R^2 = 0.9703$ |       |       |        |       |
| x5 (water content, %) | 3.267  | 0.0249 | 5.445* | 0.000 |
| x1 (plant height, cm) | 0.064  | 0.0174 | -      | -     |
| α (intercept) | 0.035  | -     | -      | -     |
| Step III, x2 ; $R^2 = 0.645$ |       |       |        |       |
| x2 (ear height, cm) | 0.018  | 0.014 | 6.170* | 0.000 |
| x5 (shelling, %) | -0.073 | 0.001 | -      | -     |
| x1 (plant height, cm) | 0.027  | 0.027 | -      | -     |
| α (intercept) | 3.404  | -     | -      | -     |
| not in model : x3,x4,x6,x7,x8 |         |       |        |       |
| **Bajeng exp farm** |         |       |        |       |
| Step I, x5 ; $R^2 = 0.285$ |       |       |        |       |
| x5 (water content, %) | 0.222  | 0.001 | 6.347* | 0.000 |
| α (intercept) | 15.049 | -     | -      | -     |
| Step II, x7 ; $R^2 = 0.522$ |       |       |        |       |
| x7 (no of seeds per cob) | 0.079  | 0.044 | 5.040* | 0.000 |
| x5 (water content, %) | -0.169 | 0.090 | -      | -     |
| α (intercept) | 11.313 | -     | -      | -     |
| Step III, x8 ; $R^2 = 0.593$ |       |       |        |       |
| x8 (weight 1000 seeds, gr) | 0.024  | 0.004 | 4.689* | 0.000 |
| x7 (no of seeds per cob) | 0.088  | -     | -      | -     |
| x5 (water content, %) | -0.170 | -     | -      | -     |
| α (intercept) | 4.096  | -     | -      | -     |
| not in model : x1,x2,x3,x4,x6 |         |       |        |       |

The result of pooled model in two locations could be assume that four variables affecting increase of grain yield in unit of xi, i=1,2,3,4. The low yield were affecting of silking periods, and water content of seeds. Harvested, the coefficient of slope shown that yield could be decrease in one t/ha, if silking and water content would be increase. Based on [10,11] reported that silking periods was mainly selected for family superior of corn. The population plants were computing of harvested in one ha were 66,000 cobs. In table 4 shown of ANOVA which is independent variable were selected by stepwise analysis and concluded that there are three independent variable were importance for selected superior families to generate of new variety opv or parent material of hybrids. Based on [12] selected five from twelve independent variable in stepwise procedure.

Table 4. ANOVA of independent variable which is selected in model

| Source of Variation | df | M.S    | Fcalc.   | Prob. |
|---------------------|----|--------|----------|-------|
| **Maros (R^2:0.645)** |    |        |          |       |
| Regression (x1, x2, x5) | 3  | 3.885  | 6.170**  | 0.005 |
| Residual            | 26 | 0.628  |          |       |
| Total               | 29 |        |          |       |
| **Bajeng (R^2:0.658)** |    |        |          |       |
| Regression (x5, x7, x8) | 3  | 5.123  | 4.060**  | 0.003 |
| Residual            | 26 | 1.889  |          |       |
| Total               | 29 |        |          |       |

** : significant different at 95%, $R^2$: 0.645
4. Conclusion
The result experiment founded that variable which is be increase of yield and significant different in Maros exp.farm were plant height (x1), water content of seeds (x2), and ear height (x5). In Bajeng shown that water content of seeds (x5), number of seeds per cob (x7), and 1000 seeds (x8), In two location yield be decrease if water content of seed was increase.

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