Performance of vegetative and reproductive characters of some maize inbred line (*Zea Mays L.*) in ultisol soil applied with the coffee skin compost

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Abstract. The objective of the research was to obtain the information of the performance of vegetative and reproductive characters of some maize inbred line on marginal land such as ultisol soil with coffee skin compost. The research was conducted on the experimental house of the Faculty of Agriculture, University of North Sumatra, Medan from October 2018 to February 2019. The split plot design by providing coffee skin compost as the main plot (without giving coffee skin compost; 2.5 kg coffee skin compost: 7.5 kg of ultisol soil; 5 kg of coffee skin compost: 5 kg of ultisol soil) and maize inbred line as subplots (G1: inbred line E, G2: inbred line B, G3: inbred line P, G4: inbred line K). The results showed that the interaction of coffee skin compost with inbred line had a very significant effect on the character of harvest age, cob length and cob weight. Strain B shows a better response for vegetative and generative characters.

1. Introduction
The rapid increase in population has resulted in an area that produces maize that has changed functions [1]. In addition, corn planting areas in Indonesia are forced into infertile land [2]. The corn development target is increasingly directed towards various environmental stresses. Therefore, we need genetic improvement of corn plants to overcome environmental stress [3]. Ultisol is a type of land in Indonesia which has a broad distribution reaching 45,794,000 ha or about 25% of the total land area of Indonesia [4]. Ultisol soil has constraints in its utilization, among others, which has physical, chemical and biological properties that do not support plant growth. pH values are usually sour, and nutrient content, especially low P is an obstacle to growth plant [5]. The use of organic materials such as compost is a solution in land crises [6]. One organic material that can be used is compost coffee skin [7]. Solid waste coffee skin (pulp) has not been used optimally, even though it has levels of organic matter and nutrients that make it possible to improve the soil. The C-organic content of coffee fruit skin is 45.3%, nitrogen content is 2.98%, phosphorus is 0.18% and potassium is 2.26%. Besides the skin of coffee fruit also contains elements of Ca, Mg, Mn, Fe, Cu and Zn [8].

Several studies have been conducted in the context of ultisol land use. One way is to conduct preliminary research into the formation of superior varieties that are resistant to marginal land by using new lines for development in ultisol soils and the utilization of coffee skin compost as an effort to improve physical, chemical and biological soil properties.
2. Materials and methods
This research was conducted at the Green House, Faculty of Agriculture, University of North Sumatera, Medan with a height of ± 32 m above sea level. This research was conducted in October 2018 to February 2019. The material used in this study was 4 (four) corn inbred line seeds (Zea mays L.) from Mexico as planting material used, coffee skin compost and ultisol soil from Tanah Merah Village, Deli Serdang as planting media.

This experiment used Split Plot Design with 2 treatment factors, namely: Factor I (Main Plot) Coffee Skin Compost, K0: without giving coffee skin compost, K1: 25% coffee skin compost: 75% ultisol soil, K2: 50% coffee skin compost: 50% ultisol soil. Factor II (Plot) 4 types of corn strain G1: Inbred line E, G2: Inbred line B, G3: Inbred line K and G4: Inbred line P. So that there are 12 treatment combinations, each treatment is repeated three times. Each repetition consists of 2 polybags so there are 72 plants. Observed variables consist of: Plant height (cm), number of leaf (pcs), stem diameter (mm), root length (cm), male flowering age (d), female flowering age (d), anthesis silk interval (d), harvest age (d), cob length (cm), number of seed rows, cob weight (g), production weight (g) and weight of 100 seed (g). Data Analysis, for the real variance continued analysis continued by using the BNT Average Test with a level of 5% The data processing of this research was carried out using Microsoft Excel program.

3. Result and discussion
The results of variance showed that the factor of coffee skin compost and strain gave a real and very significant effect on the observation character (Table 1). The characters of plant height, stem diameter, weight of 100 seeds showed very significant differences in the provision of coffee skin compost and the characters of number of leaf, root length, male flowering age, number of seedrows, production weight showed very significant differences in the inbred line population while age harvest, cob length, cob weight showed very significant differences in the interactions of compost and inbred line. Giving coffee skin compost gives a good impact on plant growth. This shows that organic matter added to the soil can improve the chemical properties of the soil and improve soil structure and increase nutrients in the soil [9]. Soil organic matter can be physically stabilized, or protected from decomposition, through microaggregation, or intimate association with silt and clay particles [10]. The water-stability of aggregates in many soils is shown to depend on organic materials and appears to be a characteristic of the soil, independent of management [11].

### Table 1. Results of analysis of varieties of corn plant characteristics

| Character                        | Env MS     | Genotype MS | GxE MS |
|----------------------------------|------------|-------------|--------|
| Plant Height (cm)                | 16525.12** | 466.24      | 487.12 |
| Number of Leaf (pcs)             | 56.34*     | 82.62**     | 3.15   |
| Stem Diameter (mm)               | 4.53**     | 0.17        | 0.14   |
| Root Length (cm)                 | 420.72*    | 228.09**    | 68.15  |
| Root Volume (cm³)                | 75.89      | 65.82*      | 20.44  |
| Male Flowering age (d)           | 23.27      | 57.43**     | 5.92   |
| Female Flowering age (d)         | 58.52*     | 58.13*      | 14.43  |
| Anthesis Silk Interval (d)       | 21.81*     | 0.83        | 1.99   |
| Harvest age (d)                  | 39.59      | 85.88       | 21.99**|
| Cob Length (cm)                  | 308.57     | 163.67      | 37.59**|
| Number of Seed Rows              | 140.36     | 21.21**     | 18.87  |
| Cob Weight (g)                   | 329.95     | 379.97      | 98.05**|
| Production Weight (g)            | 1555.64*   | 1044.29**   | 292.33 |
| Weight of 100 seed (g)           | 623.27**   | 37.519      | 32.53  |

Description: * = significantly different \( \alpha = 5\% \), ** = significantly different \( \alpha = 1\% \)
Table 2 shows that the interaction between coffee skin compost with inbred line had a very significant effect on the characters of harvest age, cob length and cob weight. In the K0 treatment (without giving coffee husk compost) the G2 (B) population showed a tendency for a better response when compared to other inbred lines populations. Each inbred line treatment showed results that were not significantly different in the characters of harvest age, cob length and cob weight.

In the treatment of K1 (75% Ultisol + 25% Coffee Skin Compost) and K2 (50% Ultisol + 50% Coffee Skin Compost) the population of G2 (B) showed a better response to all observational characters compared to other inbred lines. In the treatment of K1 and K2, the G2 (B) inbred line population showed significantly different results from other inbred line in the characters of harvest age, cob length and cob weight. This shows that the G2 (B) inbred line has a better adaptation than other populations because that each plant has a different morphology and adaptability to each situation and environmental stress [13].

| Character          | G1(E) | G2(B) | G3(P) | G4(K) | G1(E) | G2(B) | G3(P) | G4(K) | G1(E) | G2(B) | G3(P) | G4(K) |
|--------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Harvest age (d)    | 101a  | 101a  | 101a  | 101a  | 99.33b | 91a  | 99.33b | 101a  | 91a  | 99.33b | 101a  |       |
| Cob Length (cm)    | 12.96a| 15.56a| 9.06a  | 7.3a  | 10.9a  | 25.76b| 21.96b | 17.56a| 14.7a| 26.73b | 21.8a  | 19.66a |
| Cob Weight (g)     | 7.3a  | 10.44a| 4.61a  | 4.08a | 6.25a  | 21.45b| 21.69b | 10.63a| 5.695a| 31.77c | 15.07b | 12.435c |

4. Conclusion
The interaction of inbred line B with 50% coffee skin compost showed a better response to the vegetative and reproductive character of plants. The K2 planting media with 50% coffee skin compost showed a higher value for each character. Inbred line B has the highest average value of each plant character.

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