Germination speed and flowing age of corn with the utilization of organic materials fortuned *Pleurotus ostreatus* dry land

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Abstract. Organic matter plays an effective role in restoring soil fertility. This indicator of soil fertility lies in the organic content of the soil. One of the organic materials that have been proven to improve land quality is biochar and chicken manure. In addition, the use of *Pleurotus ostreatus* can increase the hormone content in organic matter. The purpose of this study was to determine the speed of germination and flowering speed of maize (*Zea mays*) with the application of organic matter enriched with the fungus *Pleurotus ostreatus*. The study was structured using a Split Plot Design (RPT). The main plot is organic matter, and the subplot is the administration of *Pleurotus ostreatus*. The study consisted of 12 treatment combinations which were repeated 3 times to obtain 36 plots of observation units. The results showed that the application of treatment had a significant and very significant effect on the speed of germination and flowering speed of maize (*Zea mays*). The combination treatment of manure + biochar with 10% *Pleurotus ostreatus* gave the speed of germination on day 4.33 and flowering speed on day 47.33.

1. Introduction
Corn is a national commodity as the second staple food after rice. Corn production is expected to increase every year to meet consumer demand which has increased every year. One of the efforts made to increase production is to increase the fertility of corn plantations on dry land. The obstacle faced in dry land is the low level of soil fertility. This is caused by a lack of organic matter in the soil. Organic matter serves to improve the physical, biological and chemical properties of the soil.

Ishak, SY et al. (2018), in their research, showed that the provision of manure from chickens consisting of solid and liquid manure mixed with food scraps and cage mats such as straw, husks, leaf litter, and so on affected growth corn [1]. Each variable that was observed had a significant effect, namely corn height, corn stalk diameter, number of corn leaves, and corn leaf area index, while the observed variable length of corn leaves had a significant effect on the age of 5 WAP and 7 WAP.

The use of biochar has been shown to increase rice production by 1.3 tons/ha in the agricultural land of Rawasari Village, Malind District, Merauke Regency [2]. The use of biochar in agricultural land can increase carbon storage in the soil because the burned biomass contains high carbon. According to Santi and Goenadi (2010), several countries have established a policy to develop biochar on an industrial scale to increase carbon storage in the soil [3].
Verdiana et al. (2016), in their research, showed that the use of rice husk biochar could provide better plant growth and yields compared to treatment without biochar. Biochar application of 2 t ha\(^{-1}\) and 4 t ha\(^{-1}\) was able to reduce the dose of inorganic fertilizers on corn plants [4].

Islami, V., 2017 stated that the application of biochar was able to increase soil pH, organic matter, total N, available P, exchangeable K, flowering age, plant height, dry canopy weight, N uptake, and P. But it did not affect increasing uptake. K and root dry weight of maize. Cow dung biochar is better than other biochar in improving the chemical properties of Ultisol soil and corn plant growth. In addition, biofertilizers are also given [5].

Biofertilizer is a living microbial component that is applied to the soil as an inoculant to help plants facilitate or provide certain nutrients for plants. In addition, biological fertilizers can also improve the quality of vegetative and generative growth of plants, such as shoot formation, flowering, and fruiting and fruit ripening processes. Rahim, I., et al. (2015) showed the benefits of Pleurotus ostreatus, which is rich in nutrients for the soil and produces the hormone IAA with concentrations up to 1,794 [6].

2. Materials and methods
The research was conducted in June-September 2021 in Jampue Village, Lanrisang District, Pinrang Regency, South Sulawesi Province. The materials used in this study were broiler chicken manure, rice husk biochar, and inoculants Pleurotus ostreatus.

The study was arranged in a Split Plot Design (RPT). The main plot is the application of organic matter consisting of 4 types, namely control, manure, biochar, and a combination of chicken manure + biochar. Sub-plots were application of inoculants Pleurotus ostreatus with 3 concentrations, namely No Pleurotus ostreatus, 5% Pleurotus ostreatus, and 10% Pleurotus ostreatus. 12 treatment combinations were repeated 3 times to obtain 36 experimental unit plots. Each treatment combination consisted of planting on plots with a size of 1.5 m X 2 m.

3. Results and discussion
Speed of germination days after planting on maize (Zea mays) which was applied with organic matter enriched with Pleurotus ostreatus, either singly or in combination, is presented in Table 1.

Table 1. Germination rate (days) of Corn (Zea mays) in the treatment of Organic Material enriched with seeds Pleurotus ostreatus.

| Pleurotus ostreatus (%) | Control | Manure | Biochar | Manure + Biochar | NP. BNT 1% |
|------------------------|---------|--------|---------|------------------|------------|
| 0 %                    | 6.00\(^{cY}\) | 5.00\(^{BXY}\) | 5.33\(^{ABY}\) | 4.67\(^{BXY}\) | Pleurotus = |
| 5%                     | 5.33\(^{DXY}\) | 4.67\(^{cXY}\) | 4.67\(^{BXY}\) | 4.67\(^{BXY}\) |             |
| 10%                    | 4.67\(^{BXY}\) | 4.67\(^{BXY}\) | 4.67\(^{BXY}\) | 4.33\(^{BXY}\) | 0.45       |

Note: Numbers followed by the same letter are not significantly different at the 5% and 1% BNT test levels. W = organic matter and Y = Pleurotus ostreatus

Table 2. Flowering age of maize (Zea mays) 80% days after planting with treatment mushroom Pleurotus ostreatus

| Pleurotus ostreatus (%) | Control | Manure | Biochar | Manure + Biochar | NP. BNT 1% |
|------------------------|---------|--------|---------|------------------|------------|
| 0 %                    | 52.67\(^{Gy}\) | 51.00\(^{cY}\) | 51.33\(^{Gy}\) | 50.67\(^{cY}\) | Pleurotus = |
| 5%                     | 51.33\(^{Gy}\) | 50.33\(^{Fy}\) | 50.00\(^{cY}\) | 50.00\(^{cY}\) |             |
| 10%                    | 50.00\(^{Fy}\) | 49.00\(^{Fy}\) | 50.00\(^{cY}\) | 47.33\(^{Fy}\) | 1.35       |

Note: The numbers followed by the same letter have no significant difference at the 1% BNT test level. Y = Pleurotus ostreatus.
The results of observations of the germination speed and flowering speed of maize (*Zea mays*) which were observed in general showed that the treatment of organic matter enriched with *Pleurotus ostreatus* with three levels either singly or in combination gave a fairly good effect on the germination and flowering speed of maize plants. Corn plant seeds that grow by 100%. This can be seen on the 6th day of observation, where all corn seeds grew 100%. The growth of maize seeds with the application of organic fertilizer enriched with *Pleurotus ostreatus* grew on average from the fourth day to the fifth day (table 1). This is due to the effect of the treatment given to the observations. In contrast, maize seeds without treatment (control) gave a fairly slow growth response. Seed growth without treatment was significantly seen when the average was the sixth day.

Observation of the flowering age of corn plants (*Zea mays*) was carried out when the flower plants in each plot showed that 80% of the flowers had come out. The application of organic matter enriched with *Pleurotus ostreatus* with three levels was able to increase the rate of flowering of corn plants. The treatment given in the observation plot had a very significant effect on the flowering age of corn plants.

The treatment that showed the best response to the speed of germination and the speed of flowering of maize was the combination treatment of broiler chicken manure + biochar with 10% *Pleurotus ostreatus* with an average germination value on days k4 - 4.33 days after planting and an average flowering day on -47.33 days after planting. The treatment that showed the best results was because the content of manure and biochar was able to improve the physical, biological and chemical properties of the soil.

The application of biochar in planting media can improve soil properties and the availability of soil nutrients in the long term [7]. The use of biochar is quite efficient in increasing soil productivity through improving physical and chemical properties [8]. The results of this study are in line with research conducted by Jien & Wang, 2013,[9] Li et al., 2018, [10] Mukherjee & Lal, 2013 [11], Shaaban et al., 2018. [12] Hussain et al., 2017, stated that the application of biochar could improve soil biological properties. [13]. The results of the study were also supported by the results of research conducted by Bista et al., 2019 [14] and Cybulak et al., 2019 [15], which stated that biochar was able to improve soil structure. Huang et al., 2020 [16] and Liu et al., 2018 [17]. In their research also stated that giving biochar can improve soil porosity. This is also in line with research conducted by Sulardi and Marahadi Siregar, 2017 which stated that giving biochar had a significant effect and could increase production. celeb rice. [18]

The application of chicken manure on casein and pakchoy growing media showed the highest yield among other types of organic fertilizers. This is presumably because the nitrogen content of chicken manure is higher than that of cow manure and compost, thereby increasing root development in the soil to absorb nutrients and water. The increase in the speed of germination of corn (*Zea mays*) was also due to the addition of *Pleurotus ostreatus*, which increased the hormone content in the soil. [19] Rahim I. et al, 2015) in their research, said that *Pleurotus ostreatus* could produce IAA hormone with a concentration of 1.974 g/l. [19] This statement is also supported by research conducted by Rahim, I. et al. 2019 which stated that *Tramella sp* combined with *Pleurotus ostreatus* with seed coating technique on shallot (*Allium cepa*) gave a significant response to the growth of shallot (*Allium cepa*) [20]. This statement is also reinforced by Kumar et al. (2012) which state that most types of rhizobacteria can increase plant growth by producing natural growth hormones such as IAA and providing other nutrients [21]. Iradjhatullah, 2017 in his research, also showed that the fungus *Pleurotus ostreatus* added to cocoa shell waste was able to increase the growth of Sulawesi varieties of cocoa seedlings [19].

4. Conclusion
The application of organic matter enriched with *Pleurotus ostreatus* with three levels, either singly or in combination, had a significant and very significant effect on the growth of maize (*Zea mays*) on germination rate and flowering rate. The combination treatment of Manure + Biochar with 10% *Pleurotus ostreatus* with an average germination rate of 4.33 DAP and an average flowering of 47.33 DAP.
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