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Effect of dung ash on healthy growth of faba bean (*Vicia faba* L.) in Werreilu south Wollo, Ethiopia

Tilahun Negash[1*], Endris Ereshid[2], Daniel Assfaw[1], Tamirat Wato[1]
[1] Department of Plant Science, Bonga University College of Agriculture and Natural Resource, Ethiopia
[2] Department of Biology, Addis Ababa University, Addis Ababa, Ethiopia

Abstract
Faba bean (*Vicia faba* L.) is cultivated in large area in Amhara region at different agro-ecologies. Despite the fact that it's wide economic importance, its production per hectare is low due to many factors biotic and abiotic factors. Among which diseases, insect pests, soil factors are the major constraints. Therefore, Soil fertility is one of the major factors which limiting faba bean crops production and productivity in the world in general. Therefore the objective of this work was Seedlings of the soil from Teff, wheat and bean field with dung ash have percentage of 94.44% 82.35% and 76.47% healthy respectively. This result could be beneficial for faba bean growers to prevent disease and increase productivity. Therefore, application of recommended to reduce diseases impact until resistant faba bean genotypes are developed and distributed to major producing regions of the country.

Keywords: ash, dung, faba bean, disease

Introduction
Faba bean (*Vicia faba* L.) is an important highland pulse crop of Ethiopia, which covered 466,697.68 ha of the cultivated land with annual production of 10,067,518.28 tons and a productivity of 1323 kg/ha. It is a legumes crop which fixes atmospheric N and improves soil fertility. The crop has largest share in area of pulses production. It is a crop of various merits in the economy of the farming communities in the highlands of Ethiopia and serves as a source of food and feed [1]. The rapid population growth in Ethiopia has increased the demand of food and fiber products and as a result it exerts pressure on environmental resources especially on land. Most of the soils in the highlands of Ethiopia have very low level of essential plant nutrients and organic matter. Fageria and Baligar [2] stated that the implementation of management practices *viz* integrated application of lime, animal organic matter and plant origin boosts the quality of soils, by reducing acidity and increasing soil chemical and physical properties, serves as a source of nutrients, improve soil moisture and neutralizes toxic Aluminum. According to reports made by Naramabuye *et al.* [3] manure is an excellent source of essential plant nutrients such as N, P and K, and also make available several the micro nutrients that plants need. Acharya [4] reported that Improving crop productions and productivity through applying fertilizers and lime having higher input cost is not sustainable management but mixing them with locally available low cost inputs such as manure, biofertilizer and ash has synergistic effect on sustainable production. Thus, integrated use of lime with locally available materials such as manure and wood ash has great opportunity to improve the crop production for resource poor farmers [3]. Farmers in the study area have access to dung and ash, though there is strong competition of these organic amendments for fuel. On the other hand, the cost of mineral fertilizers and lime is getting high, beyond their purchasing capacity. Therefore, the contributions of these locally available amendments integrated with inorganic and biofertilizers on faba bean yield need investigation However, there is little information about the effects of manure on yield response of faba bean in Ethiopian highlands in general and in the study area in particular. Therefore, this study was conducted to assess the effect of manure application on healthy growth of faba bean.

Material and Method
Study Area Description
The experiment was conducted on a farmer's field at Wereillu. It is one of the Woredas in the Amhara region, south wollo (Debub wollo zone). It is bordered on south west by Jama, on the west by Legehida, on the north by Legambo, on the north by dessie zuria, on the east by Albuko, and the south east by the Wonchet which separates it from the north shewa Zone. The field samples were collected from this Woreda kebele specifically known as Meni. It lies 10°33′24 North latittude and 39°24′14 east longitude. in this area the altitude is 2812 meters above sea level. The experimental site is categorized under moist cool (M4) agro-ecology [5]. The distribution of soil types in ANRS is Luvisols, Cambisols, Leptosols, Nitisols, Vertisols, Acrisols and Regosols, respectively [6], and these soils are dominantly acidic in nature. This experiment was conducted on Nitisol soil. Faba bean, wheat, barley, barley and teff are the major crops grown in the study area. The faba bean seed was planted in the Addis Ababa university botany laboratory.

Sampling Methods and Experimental Procedures
The sample of black soil, dung ash and faba bean was collected from the study area (fig 1). Soil sample collected from a field where teff, faba bean and wheat had been harvested. The ash was from cattle, donkies, horse, goats and sheep's dung burnt together with undetermined amount and faba bean was sampled from the faba bean harvested in

the last year. The soil and dung ash sample measured by using measuring balance but the faba bean seeds for planting material was selected by color and size. Six pots were ready made for the experiment. 1.75 kg black soil was added in each pots and it represented by letters A, A^1 B, B^1,C and C^1, where A, B and C represent controls of soils from teff field, faba bean field, and wheat field respectively and A^1, B^1 and C^1 represent experimental groups from teff field, faba bean field and wheat field respectively. A 20% (0.25 kg) dung ash was added in each experimental group. 18 seeds were planted in each A (control) and A^1 (experimental), and 17 seeds were planted in each B (control), B^1 (experimental) C (control) and C^1. All the groups were watered with equal amount of water (1littre) for the first time after the seeds planted. The experiment was categorized in to three to observe disease; totally died, affected and healthy simply by looking by naked eye.

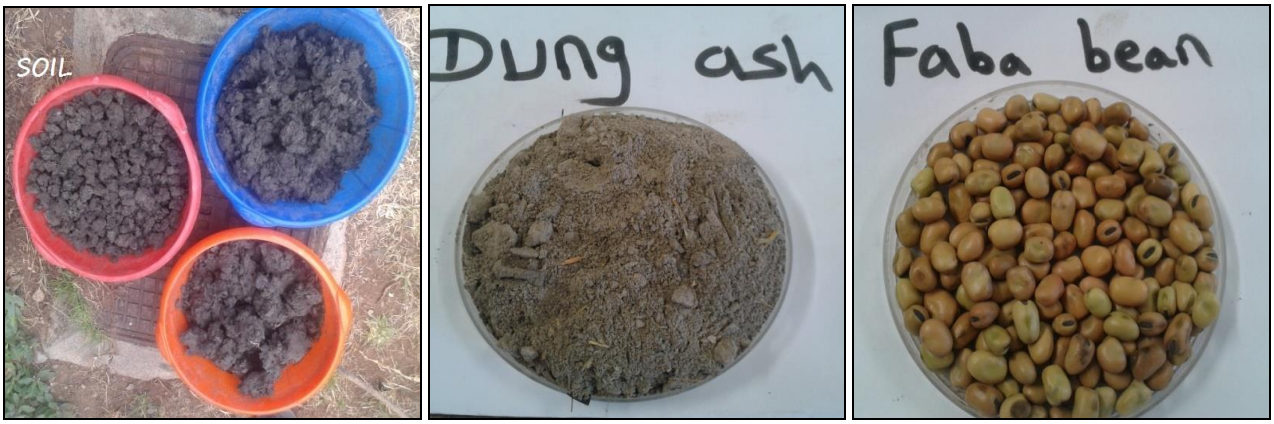

Fig 1: The sample of soil, dung ash and Faba bean

The percents were calculated as: percent of healthy $= \frac{No.of\ seedlings\ healthy}{died+affected+heathy} \times 100$,

$$\% \text{ of died} = \frac{No.of\ seedlings\ died}{No.of\ seedlings\ died+affected+heathy} \times 100$$

And

$$\% \text{ of affected} = \frac{No.of\ seedlings\ affected}{died+affected+heathy} \times 100$$

Data Analysis

The collected data were analyzed using Microsoft excel to assess the effect dung ash health performance of faba bean.

Result

A total of 6 faba bean growing pots were assessed in Addis Ababa university Arat kilo campus botany lab on 24th April 2015. The crop growth stage during the experiment was germinating the flowering stage. After ten days almost seedling was started leaf until that day there was not significant difference between all seedlings. But after fifty days some disease symptoms was observed on stem part of the control group (A, B and C). The seedlings that were growth in the experimental group (A1, B1 and C1) were healthier.

Fig 2: After 30 days; the difference between control and experimental groups

Table 1: The comparison of the percent survival of faba bean seedlings with and without the use of dung ash in the experiment

Soil collection site	Pot	No. seedlings died	No. seedlings affected	No healthy seedling	Total No. seeds of faba beans	% of died	% of affected	% of healthy seedlings
Teff field	A	9	5	4	18	50.00	27.78	22.20
	A^1	0	1	17	18	0.00	5.55	94.44
Bean field	B	12	4	1	17	70.58	23.52	5.89
	B^1	0	4	13	17	0.00	23.52	76.47
Wheat field	C	10	5	2	17	58.88	29.1	11.76
	C^1	1	2	14	17	5.88	11.6	82.35

Conclusion

The soil from the Teff field was more suitable for the growth of Faba bean. All the seedlings were survived about the last experiment (flowering stage). The only 5.55% was affected by little stem and leaf disease in the experimental group, but in the control group (without dung ash) 50% of the seedlings were died and 27.7% affected by the disease. The height and numbers of leaf were well developed in the experimental (A^1). The number of seedling died that was grown in the control group from the bean field was twelve from the total 17 seedlings, the soil was more. In Compact in contrast from the total of another 17 seedlings all of them were survived with some disease symptoms on the leaf and stem parts.

In The wheat field's soil seedlings more symptoms were also observed with percentage of 29.4%.the experimental group has the percentage 82.35% were healthy next to the experimental group (A^1). In many literatures improving soil fertility can influence the resistance of plants to pathogens [7]. Generally, adequate fertilizer reduces the infection rate [8]. Application of dung ash increased the crop healthy growth. Among the sole treatments, addition of 8 t (tone) FYM ha^{-1} was superior in bringing about. No diseases symptom was observed in an experiment treated with dung and ash. On the other hand, these growth attributes were found to be the lowest in the control. The observed increased growth characteristics of faba bean could be due to the incorporation of dung and ash, which supply favorable chemical, physical and biological soil environment in the growth medium. Therefore, in the study area dung ash should be applied to improve health performance of faba bean.

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