The Effect of Kakawate *(Gliricidia sepium)* .Jacq. Kunth ex Walph. Leaves on the Growth of Onions *(Allium cepa)*

Alfredo R. Rabena
Karen F. Rabena
University of Northern Philippines, Vigan City

Abstract

This study was undertaken to determine the effect of different fertilizer treatments on germination and early growth parameters of onion such as height, weight, root length and shoot length. The treatments used were control with no fertilizer, treatment 1 with kakawate leaves and ammonium sulfate and treatment 2 with pure ammonium sulfate.

Results showed that high percentage germination was observed in bulbs treated with kakawate leaves plus ammonium sulfate and low percentage germination in control. Onion bulbs treated with kakawate organic fertilizer plus ammonium sulfate were the first to germinate. Germination of seeds normally started eleven days after sowing.

Onions treated with kakawate leaves plus ammonium sulfate had the highest average seedling height and weight. Plants treated with ammonium sulfate obtained the longest roots and shoots with only a very little difference with kakawate leaves plus ammonium sulfate. Results also showed that height and root length are significantly increased when applied with kakawate fertilizer plus ammonium sulfate.

With the results above, the authors strongly recommend kakawate leaves as additive in soil or can be made into organic fertilizer as alternative to high priced commercial fertilizer. The organic fertilizer should be mixed with commercial fertilizer to improve soil productivity and fertility and reduce costs due to high priced commercial fertilizers. This study is timely to introduce to help the environment recover from the negative impacts of using synthetic fertilizer such as soil nutrient loss and climate change. It should also be studied on-site with crops such as onions, corn and other crops. Researchers and farmers should consider the potentials of kakawate as a farm input.

Keyword index: kakawate, *Gliricidia sepium, growth, Allium cepa*

INTRODUCTION

The Integrated Nutrient Management (INM) is the combined use of organic and inorganic fertilizers accompanied by sound cultural practices in crop production. (NM aims to sustain soil fertility through an integration of different available nutrient sources and their methods of application that will produce maximum crop yield with minimum input use (Ocampo, 2004). In this technique, there is balance between application and utilization and is determined by what crop needs and to what extent the soil has. This technique includes agricultural practices such as organic matter maintenance, crop rotation, maintenance of vegetative cover, proper tillage, cropping pattern, and utilization of organic fertilizers.

On degraded lands, the use of agronomic, biological and mechanical methods is of great interest. Restoring the soils' nutrients of these areas is one concern sustainable agriculture. The different interventions primarily aim to reduce inputs from the use of inorganic materials which would eventually lead to increase in yield and disease resistance of crops.

When making organic fertilizers, one can do conversion of crop residues, animal manures, and industrial wastes and by-products. Organic fertilizer has the essential elements such as nitrogen, phosphorous and potassium. With recent technologies on soil management practices, organic farming has a big role in attaining sustainable agriculture.

One promising bio-organic fertilizer is kakawate *(Gliricidia sepium)*. **It** leguminous tree species which is a nitrogen fixing tree that has potential of restoring and maintaining soil fertility (Diouf, et al, 2008). It is rich in nitrogen that grows mostly in forests and could grow from five to ten meters tall. It is known to reduce topsoil erosion which is important in first stage of reforesting denuded areas. More than these advantages, the tree has a lot of uses to the farmers for it serves as green manure in croplands (Tacio, 2009). The plant's natural nitrogen content makes it ideal for fertilizer application. Carandang (2004) provided simple method to prepare liquid nitrogen fertilizer from kakawate leaves. Mindanao Baptist Rural Life Center (MBLRC) in Davao del Sur primarily used kakawate leaves along with other household garbage as compost materials. Aside from acting as organic fertilizer, it also a good source of organic insecticide.

Due to farmers' rampant adoption of inorganic farming which entails degradation of the soils' natural reserve, organic farming as a technology is introduced to improve soil fertility and productivity. A good technology is one that could sustail

onion growers or any fanner good harvest, low expenses and promising market value. This is realized when there are lesser fann inputs such as synthetic fertilizer and pesticide which eventually give them more income. Also, the effects of chemically-based fertilizer must be addressed by informing farmers on its subsequent negative effects. Onion growers need to be infonned on the potential of kakawate as farm input especially on the benefits to the health and environment. They should also be encouraged to adopt this technology not only in onions but with other crops such as rice and com that would help them address subsequent effects of intensive use of synthetic fertilizer and pesticides which require more expenses.

This study was conducted to determine the effects of kakawate leaves on the growth of onions. It detennined the percentage of germination of onions and some early growth parameters such as height, weight, root and shoot length. Kakawate was considered in the study because of its potential for improving soil fertility due to its high nitrogen content. Farmers use it as mulch or incorporate it into the soil during planting. Thus, the kakawate leaves can be made into organic fertilizer in liquid or in dry fonn or can be mixed with inorganic fertilizers.

Kakawate scientifically known as *Gliricidia sepium* is a tree legume popular to the rural folks as a ripening agent for their harvested banana. (http://blog.agirculture.ph) It is a tropical tree that grows mostly in forests and could grow from 5 to I0 meters tall. Its leaves are opposite, 4-6 cm long with a pointed tip and rounded base. The flowers are pink and appear clustered racemes (Rabout, et al, 2005). It is native in Central America, and has been naturalized everywhere because of its adaptability to any type of condition. It is well adapted to humid areas and acid, infertile soil. It also suits well to varied production systems and can be grown easily together with other grasses or herbaceous legumes (Villar cited by Tacio, 2009). It can be easily propagated and grows quickly.

The plant uses include as live fence, forage, windbreaks, shade, organic fertilizer, fuel wood and construction poles (Raboy et al., 2005). It has a promising role to reduce topsoil erosion in the initial stages of reforesting denuded area, an intennediate step to be taken before introducing species that take longer to grow (Tacio, 2009). Kakawate is used as live fence to border properties, as shade tree and wind break, and as feed resource of livestock (Villar cited by Tacio, 2009). Kakawate is also an excellent feed for livestock. It has 56-68 percent crude protein of dry matter digestibility found on leaves, crude fiber with 21 percent, and phosphorous with 0.13 percent and some carotene (Villar cited by Tacio, 2009). The leaves also release bioethylene which is a gas that ripens fruits (UPLB cited by Tacio, 2009).

Kakawate was also used as hedgerows in double or triple rows along the contour. It follows a distance of 25 cm between rows and 30 cm between hills. The

hedgerows are pruned and trimmed after one year. Kakawate leaves and branches are chopped into small pieces then dried before spreading in the alleys. The technology improved soil fertility and crop yield due to remarkable increase in income for three consecutive years.

The tree can be a raw material for producing botano-insecticide. A study made by Raboy et al. (2005), used kakawate as botano pesticides for corn intercropped with peanut and eggplant. Their result showed crops treated with kakawate leaf extracts had the highest total harvest. Meanwhile, Rabena and Rodillas (2004) discovered that this plant contains coumarin which is an effective botanopesticide. It acts potently in insects, termites and bed bugs.

A study made by Badayon and Pangga determined the effect of kakawate on the growth performance and yield of eggplants and on soil physical and chemical properties. They found out that eggplants fertilized with combined inorganic and kakawate fertilizer were the most vigorous characterized by faster growth rate and heavier fruits than the other treatments. (http://blog.agriculture.ph)

Objectives of the Study

This study aimed to determine the effects of kakawate leaves on the growth of onions. Specifically, it determined the percentage germination of onions under three conditions namely: control having no fertilizer, Treatment 1 containing kakawate leaves and ammonium sulfate and Treatment 2 applied with ammonium sulfate. It determined the growth performance of onions in terms of plant height (cm), plant weight (g), and root length (cm) and shoot length (cm).

METHODOLOGY

The study was delimited to the effects of kakawate leaves on the germination and early growth of onions.

There were three treatments namely T0 (control, no fertilizer), Tl (kakawate leaves and ammonium sulfate) and T2 (ammonium sulfate). Statistical design used in the experiment was RCBD with three (3) replicates.

The soil used was a sandy loam soil mixed with small amount of sawdust to ensure drainage of excess water. The fertilizers were applied before sowing and one month after germination. One kilogram of fresh leaves were crushed and soaked in IO liters of water for 24 hours for faster release of nutrients when incorporated in the soil.

The water where the leaves were soaked was then used for watering the plants. Fifteen (15) grams of soaked leaves were used in the study.

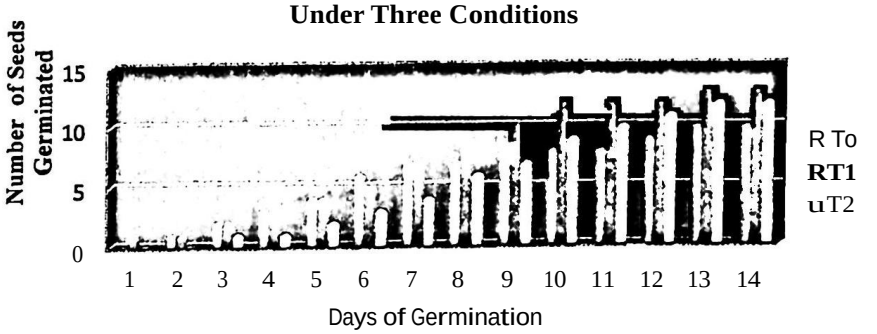
The onion bulbs were sown in plastic pots with holes. The seed pots were watered a day before sowing and were irrigated at field capacity. Sowing of onion bulbs was done by drilling about 2cm deep with about I inch between seeds. There were 15 bulbs sown for each replicate. Germination of onion bulbs normally started 11 days after planting. After germination activity, there was only one seedling grown in pot per treatment to measure growth parameters.

The onions were harvested after three months of observation. Growth parameters such as weight of plant, height of plant, root length and shoot length were determined. Data were analyzed statistically.

RESULTS AND DISCUSSION

Percentage Germination. Results showed (Figure 1) that the higher percentage germination was observed on seed treated with soaked kakawate leaves plus ammonium sulfate with 87 percent, followed by treatment 2 with 80 percent, and 67 percent on control with no fertilizer added. With the rate of germination, onions treated with kakawate leaves plus ammonium sulfate were the first to germinate with 11 days after planting indicated here as Day 1.

Figure 1. Cumulative Germination of Onion Under Three Conditions



Height. In terms of height, plants treated with kakawate leaves and ammonium sulfate obtained the highest with an average of 26.7 cm while control was the shortest with an average of 20.0 cm. Analysis of variance revealed that there is a significant difference at 5 percent level of significance on the height of onions as

affected by different fertilizers applied. This means that height is significantly affected by combination of kakawate leaves and ammonium sulfate.

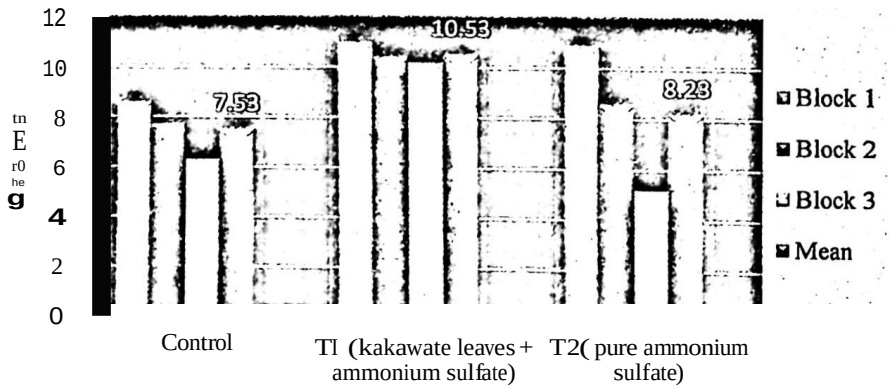
Table 1. Height of Onions as Affected by Different Fertilizers

Treatments	Blocks (height in cm)			Average (cm)
	1	2	3	
T Control (no fertilizer added)	23.2	17.8	19.0	**20.0b**
T, kakawate leaves + ammonium sulfate	26.1	25.5	28.5	**26.7a**
T, pure ammonium sulfate	22.9	23.6	24.0	23.5ab

significant at 0.05 level of significance; same letters in a column indicate no significant difference between them

In comparing which of the treatment means significantly differed by using Scheffe test, it was found out that only the control differed significantly from treatment I (kakawate and ammonium sulfate). The rest of the different treatments had the same effects.

Figure 2
Weight of Onions under Three Conditions



. **Weight.** The heaviest plant was recorded in TI with 10.5 grams while lightest was recorded on control with 7.5 grams. Although there are differences on the means for the different treatments, the values are not that large to conclude that they are significantly different from each other.

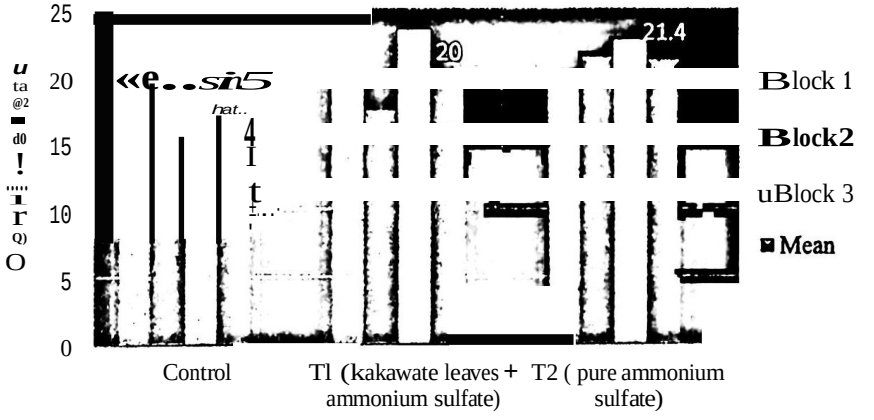
Table 2. Root Length of Onions as Affected by Different Fertilizers

Treatments	Blocks (cm)			Average
	1	2	3	
Control (no fertilizer added)	3.0	3.3	1.5	2.6ab
T, (kakawate leaves + ammonium sulfate)	4.0	5.2	2.8	4.0b
T, (pure ammonium sulfate)	5.5	6.5	5.8	5.9a

significant at 0.05 level of significance; same letters in a column indicate not significant difference between them

Root Length.The longest in terms of roots was recorded on T2 with 5.9 cm while control got the shortest with an average of 2.6 cm. Mean root lengths are statistically different from each other with 5 percent level of significance. Control and T2 are significantly different from each other using Scheffe Test which means that these two treatments have unequal effects on root length of onion.

Figure 3
Shoot Length of Onions under Three Conditions



Meanwhile, shortest shoot/leaf (17.5 cm) was observed in control treatment and longest shoot/leaf (21.4 cm) was observed in ammonium sulfate. Different treatments did not differ significantly.

The findings coincide with the study conducted by Badayos and Pangga (2001) on the potential of kakawate as bio-organic fertilizer. They found out that eggplants fertilized with combined inorganic and kakawate fertilizers were the most

vigorous characterized by faster growth rate and heavier fruits than the other treatments. (blog.agriculture.ph)

CONCLUSIONS

Onion bulbs had higher and faster rate of germination when treated with kakawate leaves plus ammonium sulfate. Plants fertilized with kakawate leaves plus ammonium sulfate had the greatest height (26.7cm) and greatest weight (10.53 grams). Plants fertilized with ammonium sulfate fertilizer obtained the longest roots with 5.9 cm followed by kakawate organic fertilizer plus ammonium sulfate with 4.0 cm. Longest shoot/leaf was observed also on onions treated with ammonium sulfate fertilizer with 21.4 cm followed by kakawate leaves plus ammonium sulfate with 20.2 cm.

RECOMMENDATIONS

It is recommended that kakawate leaves can be used as additive in soil or can be made into organic fertilizer as alternative to high-priced commercial fertilizer. It should be mixed with commercial fertilizer to improve soil productivity and fertility and reduce costs due to high-priced commercial fertilizers. This study is timely to introduce to help the environment recover from the negative impacts of using synthetic fertilizer such as soil nutrient loss and climate change. Also, it should be studied on-site with crops such as onions, com, rice, and other crops. Researchers and fanners should consider the potentials of kakawate as farm input. A study on economic aspect i.e. income and harvest of this intervention should be further studied.

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