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Effects of sodium polyacrylate to the growth of *Vigna radiata* (Mung bean)

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Abstract
In recent years, the importance of environmental preservation has been brought to the forefront of Philippines policy making. As a result, new policies have been drafted affecting many different aspects of environmental preservation in the country. Unfortunately, no studies were conducted on how sodium polyacrylate affects plant growth. This study utilized a controlled experimental design, specifically quasi-experimental design, of which isolation, augmentation, control, as well as data analysis are conducted under laboratory conditions. Basically, the study illustrated what could a sodium polyacrylate possibly do save Mother Nature, in this case adding it to plant soil. The collection of polyacrylate in used absorbent materials from wastes could lessen the damage it introduced to soil and the environment in general. The additive in spotlight can help reduce the risk of pollution and deforestation while allowing people, even in urban areas, to go for a greener initiative and make use of what once thought as an insignificant material to be reused again for an additional purpose.

Keywords: Plant medium, alternative, recycling waste, prevention, pollution

1. Introduction
In recent years, the importance of environmental preservation has been brought to the forefront of Philippines policy making. As a result, new policies have been drafted affecting many different aspects of environmental preservation in the country. Current laws on forest conservation focus only on specific areas here in the country such as establishment of Tubbataha Reefs Natural Park in Palawan (R.A. 10067) or establishments of Mount Banahaw and San Cristobal as protected area (R.A. 9847).
Plan growth studies have been prying on the attentions of researchers around the world with topics focusing on growth-promoting bacteria (Numan *et al*., 2018; Santoyo *et al*., 2016; Vejan *et al*., 2016) [8, 10, 11], physiology of plant growth (Hilty *et al*., 2019) [5], role of fungi in plant growth regulation (Begum *et al*., 2019) [2], promoting heavy metal resistance in plants (Ahemad, 2019) [1], and controlling salinity level for enhancing plant growth (Safdar *et al*., 2019) [9].
Meanwhile, studies on sodium polyacrylate are not that many with topics concentrating on water solubility of the material (Gulyayeva *et al*., 1976) [4], synthetic hydroxyapatite creation (Misra, 1993) [9], and crafting self-crosslinking sodium polyacrylate (Hua & Qian, 2001) [6].
Unfortunately, no studies were conducted on how sodium polyacrylate affects plant growth. As citizens, since no laws yet are passed for the overall forest conservation, one must do their share and contribute to countering the cause at hand. In keeping with the spirit of this responsibility, this study was conducted to better understand life cycle ecology and have baseline data on how to enhance or speed up plant growth.
To make this goal attainable the researcher chosen to limit the area of study to a life cycle of *Vigna radiate* (Monggo) planted in both loam soil and soil-polymer mixture.

2. Objectives
With this in mind, the goal to focused on the investigation on the growth of *Vigna radiate* (Mung Beans) in ordinary loam soil and soil mixed with varying amounts of Sodium Polyacrylate. In addition, the information compiled will serve as a support for environmental means.

3. Methodology

This study utilized a controlled experimental design, specifically quasi-experimental design, of which isolation, augmentation, control, as well as data analysis are conducted under laboratory conditions (Fraenkel & Wallen, 2012) [3].

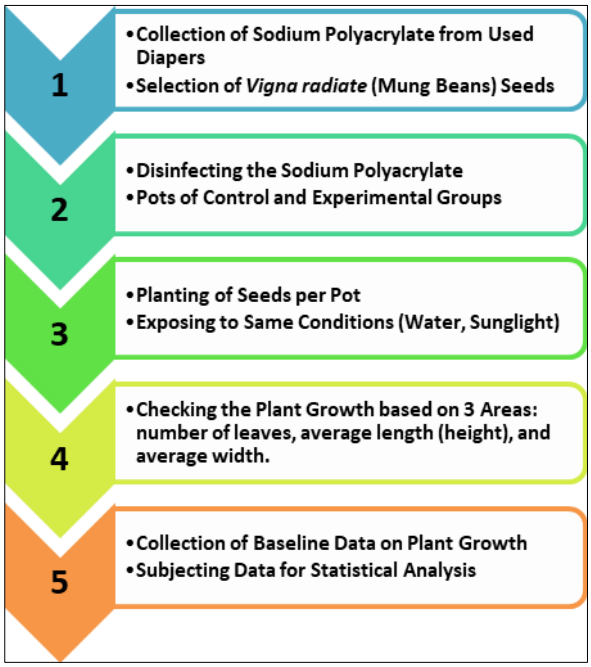

Fig 1: Process Flowchart

For gauging the characteristics of the plant growth, the researcher opted to focus on the physical attributes such as number of leaves, average length (height), and average width.

Table 1: Composition of Experimental and Control Groups

Material (in grams)	Experimental	Control
	Sodium Polyacrylate	Loam Soil
Sodium Polyacrylate 1 (SP1)	25	75
Sodium Polyacrylate 2 (SP2)	50	50
Sodium Polyacrylate 3 (SP3)	75	25
Sodium Polyacrylate 4 (SP4)	100	0
Loam Soil (LS)	0	100

The variation of plant growth physical characteristics was subjected to statistical analysis, both descriptive and inferential statistics, with the aid of Microsoft Excel Data Analysis and SPSS.

4. Results and Discussion

Results garnered for this study was treated as an innovation for changing the beliefs of plant growth and having a new media added to prevent deforestation and constant threat of land pollution. The following are the salient findings of the study:

a. Number of Leaves

It can be gleaned on the table that mung beans planted on SP3 generated the greatest number of leaves with an average of 6, followed by SP2 with average of 4 leaves, while SP1 and LS generated an average of 3 leaves and SP4 which is the pure sodium polyacrylate with no soil mixed in generated an average of 2 leave.

Basically, it showcased that more leaves are expected for soils with additive of 75% of sodium polyacrylate. It retains more water that it could help increase plant growth.

Table 2: Number of Leaves per Medium

Material (in grams)	Number of Leaves			
	Trial 01	Trial 02	Trial 03	Ave
Sodium Polyacrylate 1 (SP1)	3	4	2	3
Sodium Polyacrylate 2 (SP2)	5	4	3	4
Sodium Polyacrylate 3 (SP3)	6	7	5	6
Sodium Polyacrylate 4 (SP4)	2	1	3	2
Loam Soil (LS)	3	2	4	3

b. Average Length of Stems

It can be gleaned on the figure that mung beans planted on SP3 generated the highest length of stem with an average of 2.6 cm, followed by SP2 with average of 2.4 cm, while SP1 and LS generated an average of 2.2 cm and SP4 which is the pure sodium polyacrylate with no soil mixed in generated an average length of stem of 1.2 cm.

Basically, it showcased the same pattern with the previous data wherein an visible increase in length of stem are expected for soils with additive of 75% of sodium polyacrylate. It retains more water that it could help increase plant growth.

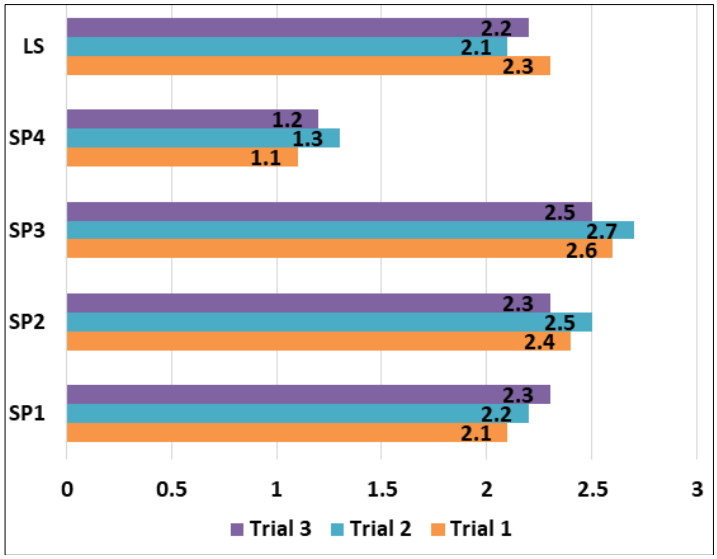

Fig 2: Length of Stems per Medium

c. Average Width

It can be gleaned on the table that mung beans planted on SP3 generated the greatest plant width with an average of 2.0 cm, followed by SP2 with average of 1.7 cm, while SP1 and LS generated an average of 1.5 cm. Lastly, SP4 which is the pure sodium polyacrylate with no soil mixed in generated an average plant width of 1.1 cm.

In unlikely turn, the figures and orders of result for this third characteristic, showcased the same pattern with the previous tests that thicker plant are expected for soils with additive of 75% of sodium polyacrylate.

The very reason that I can lock in moisture which could mean easily accessible water source for the plant to get and used even without watering for a certain period of time. It retains more water that it could help increase plant growth.

Table 3: Width of Plant per Medium

Material (in grams)	Number of Leaves			
	Trial 01	Trial 02	Trial 03	Ave
Sodium Polyacrylate 1 (SP1)	1.6	1.4	1.5	1.5
Sodium Polyacrylate 2 (SP2)	1.7	1.8	1.6	1.7
Sodium Polyacrylate 3 (SP3)	1.9	2.0	2.1	2.0
Sodium Polyacrylate 4 (SP4)	1.1	1.0	1.2	1.1
Loam Soil (LS)	1.4	1.5	1.6	1.5

5. Conclusion and Recommendation

Basically, the study illustrated what could a sodium polyacrylate possibly do save Mother Nature, in this case adding it to plant soil. The collection of polyacrylate in used absorbent materials from wastes could lessen the damage it introduced to soil and the environment in general. The additive in spotlight can help reduce the risk of pollution and deforestation while allowing people, even in urban areas, to go for a greener initiative and make use of what once thought as an insignificant material to be reused again for an additional purpose.

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