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FACTORS AFFECTING THE GROWTH PERFORMANCE OF LEGUME CROP: *VIGNA RADIATA* LINN

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ABSTRACT

The present paper highlights the germination and growth performance of legume crop such as *Vigna radiata* Linn. can be determined by the nature of soil types and organic manures were used. The results obtained from the present study reveals that the use of organic manures in various agricultural crop is highly significant in their growth and yield than that of chemical fertilizers used. The green manures can improves the soil fertility and also stimulate the growth of beneficial soil microbes and earthworms.

INTRODUCTION

Soil is the store house of plant nutrients and serve as a natural organic medium for the growth of plant and micro-organisms [1,2]. The major components in the soil are minerals, organic matter, water and air. The proportion which vary with respect to time, site and depth [3]. The decomposition of organic manure can improve the physical properties of the soil and also provide the food for soil micro-organisms which are responsible for various activities in the soil [4,5].

There are different types of soil in our environment. Among them red and black soil types are very characteristic for the growth of various agricultural crops [6,7]. Red soil is formed from crystalline metamorphic rocks which consist largely of granites with subordinate rocks rich is ferromagnesian minerals, the red soil may be found in different shades *viz*, red, dark red, brownish red. The black colour of black soil is due to the presence of titaniferous magnetite, organic compounds, iron, aluminium and accumulated humus [8,9].

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METHODOLOGY

The soil amendments prepared by following patterns.

Black Soil		Red Soil	
Pot-1	Black soil without manure (Control)	Pot-1	Red soil without manure(Control)
Pot-2	Black soil + Calotropis	Pot-2	Red soil + Calotropis
Pot-3	Black soil + Tephrosia	Pot-3	Red soil + Tephrosia
Pot- 4	Black soil + Vallisneria	Pot- 4	Red soil + Vallisneria
Pot- 5	Black soil + Azolla	Pot- 5	Red soil + Azolla

Red soil and black soil were used for the study and it is prepared by using two kinds of green manures such as terrestrial (*Calotropis procera* L. (Asclepiadaceae), *Tephrosia purpurea* L. (Fabaceae) and aquatic weeds (*Vallisneria spiralis* L. (Hydrocharitaceae), *Azolla pinnata* R.Br. (Azollaceae) (Plate-2). These soil mixtures were poured in to pots (Height-25 cm, diameter 17 cm and top diameter 30 cm). There are about 25 seeds of *Vigna radiata* L. (Plate- 1) were sowed in to the pots (10 Nos.) containing both black and red soil with green manures respectively (200 gms. each) (Plate- 3). The

germination and growth performance of these seeds were measured in regular intervals of 15th and 30th day of sowing (Plate- 4 & 5).

RESULTS AND DISCUSSION

The main aim of the present study to find out the rate of germination percentage and growth performance of legume crop such as *Vigna radiata* L. in red and black soil with both terrestrial and aquatic weeds.

The germination percentage of *Vigna radiata* L. seeds were sowed in black soil with both terrestrial (*Tephrosia* and *Calotropsis*) and aquatic (*Vallisneria* and *Azolla*) weeds shows slightly higher rate than that of red soil with both weeds (Table-1). The shoot and leaf length of the seedlings in all ten pots were calculated in the 15th and 30th day of sowing, which shows the length of both shoot and leaves become higher in red and black soil with *Vallisneria* manure than that of other green manure treated pots (Table- 2 & 3)

The root length was calculated on the 30th day of sowing. It is reveals that, the root length of the seedlings in black and red soil with *Vallisneria* manure were slightly higher than that of other green manure treated pots (Table- 4).

Organic fertilizers are natural materials that have undergone little or no processing [10,11]. They include both biological (plant and animal) and mineral materials. Once in the soil, organic fertilizers release nutrients through natural processes, including biological breakdown of organic matter and chemical weathering of mineral materials [12,13]. The released nutrients are available to the plants in water-soluble forms. These soluble forms of nutrients are the same as those supplied by processed fertilizers. When compared with processed fertilizers, organic fertilizers release the nutrients slowly to the soil and the rate of nutrient release from organic materials depends on the activity of soil micro organisms [14]. There are some factors such as temperature, moisture and nature of the soil conditions are mainly depends on the releasing of nutrients from these organic matters [15].

The results obtained from the present study reveals that, the germination percentage of *Vigna radiata* L. was higher in black soil with green manures than red soil with green manures. But the overall growth performance of *Vigna radiata* L. was higher in red soil with aquatic weed such as *Vallisneria* than other green manures used.

Table 1. Germination percentage of seeds in Black soil and Red soil with different green manures

S.No.	Soil types + Green manure	Number of seeds sown	Number of seeds germinated	Percentage of germination
1	Black soil – (control)	25	21	21/25 x 100 = 84 %
2	Black soil + Calotropis	25	24	24/25 x 100 = 96 %
3	Black soil + Tephrosia	25	24	24/25 x 100 = 96 %
4	Black soil + Vallisneria	25	24	24/25 x 100 = 96 %
5	Black soil + Azolla	25	23	23/25 x 100 = 92 %
6	Red soil – (control)	25	20	20/25 x 100 = 80 %
7	Red soil + Calotropis	25	20	20/25 x 100 = 80 %
8	Red soil + Tephrosia	25	22	22/25 x 100 = 88 %
9	Red soil + Vallisneria	25	23	23/25 x 100 = 92 %
10	Red soil + Azolla	25	22	22/25 x 100 = 88 %

Table 2. Average shoot length of plants on 15th day and 30th day

S.No.	Soil types + Green manure	Average shoot length on 15 th day	Average shoot length on 30 th day
1	Black soil – (control)	21	22
2	Black soil + Calotropis	19.8	21
3	Black soil + Tephrosia	20	22
4	Black soil + Vallisneria	22	24.2
5	Black soil + Azolla	21	23
6	Red soil – (control)	21.5	23.2
7	Red soil + Calotropis	20	22.2
8	Red soil + Tephrosia	21	23.4
9	Red soil + Vallisneria	25.5	27.2
10	Red soil + Azolla	24.2	25.7

Table 3. Average leaf lengths (young and matured) on 15 th day

S.No.	Soil types + Green manure	Average length of young leaves on 15 th day	Average length of matured leaves on 15 th day
1	Black soil – (control)	2.1	4.5
2	Black soil + Calotropis	2.8	5.1
3	Black soil + Tephrosia	2.6	5.2
4	Black soil + Vallisneria	2.9	5.9
5	Black soil + Azolla	2.5	5.7
6	Red soil – (control)	2.2	4.7
7	Red soil + Calotropis	2.8	5.3
8	Red soil + Tephrosia	2.7	5.4
9	Red soil + Vallisneria	3.2	6.1
10	Red soil + Azolla	3	5.8

Table 4. Average root length of plants on 30 th day

S.No.	Soil types + Green manure	Average root length on 30 th day
1	Black soil – (control)	3.3
2	Black soil + Calotropis	3.5
3	Black soil + Tephrosia	3.7
4	Black soil + Vallisneria	5.5
5	Black soil + Azolla	5.4
6	Red soil – (control)	3.5
7	Red soil + Calotropis	3.9
8	Red soil + Tephrosia	4.1
9	Red soil + Vallisneria	6.5
10	Red soil + Azolla	6

PLATE 1

Vigna radiata. Linn., (Fabaceae)

PLATE 2

SELECTED WEEDS

Terrestrial Weeds:

Calotropis procera. (Asclapiadaceae)

Tephrosia purpurea L.(Fabaceae)

Aquatic weeds :

Vallisneria spiralis Linn (Hydrocheritaceae.)

Azolla pinnata (Azollaceae)

PLATE 3

SEED GERMINATION IN RED & BLACK SOIL

RED SOIL

BLACK SOIL

PLATE 4

MEASUREMENT OF ROOT LENGTH & SHOOT LENGTH & LEAF LENGTH

PLATE 5

GROWTH PERFORMANC OF Vigna radiata. L. IN RED & BLACK SOIL

RED SOIL

BLACK SOIL

CONCLUSION

The result obtained from the present study concluded that, the application of green manures to the soil can increases the germination percentage and overall growth performance of various agricultural crops than chemical fertilizers used. It improves soil fertility and there by it can stimulate the growth of beneficial soil microbes and earthworms. In this present scenario, the researches on organic fertilizers and its influence on various agricultural crops is an urgent need for future generation.

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