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Role of Green Manuring in Soil Health Improvement

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ABSTRACT: Soil health degradation is one of the most important problems faced by farmers. The use of chemical fertilizers deteriorates the soil physical, chemical and biological properties. Consequently, alternate solutions to overcome soil degradation, especially agriculture lands, the natural way of green manuring came into existence. The use of green manuring improves the soil health. Most often, the plants which are leguminous, nitrogen rich and fast growing are used as green manure along with non leguminous plants for enriching soil in turn to increase crop growth and yield without any harm to the environment. The plants used for green manuring progress the humus, organic carbon content, available nitrogen and soil microbial population build-up. The special role played by green manuring is increase soil pore space and control soil erosion. In addition, green manuring crops help to suppress weeds, reduce pest and disease problems and also provide supplementary animal forage. Thus, the present study indicates the type and importance of green manuring on soil health.

KEYWORDS: Green manure, Fertilizers, Soil Health

I. INTRODUCTION

In this contemporary world soil degradation is major constraints faced by peoples. There are so many factors responsible for soil degradation are excessive use of chemical fertilizers and other industry wastes.(Naik M and Kumar P , 2020). The accumulation of the agrochemicals leads to health hazards and environmental issues. The soil health like soil physical properties are also affected by these chemicals also the loss of organic material, high acidic soils also cause damage to microbes and plants present in soils. So to overcome all the issues the green manure crops were very beneficial for soil health improvement and also played role in crop yield.(Chitra Mani & Kumar P, 2020).

II. METHODOLOGY

Green Manure Crops

Green manure, also referred to as fertility building crops, may be defined as cultivation of crops for the benefits of the soil. There are various types of green manure in India like dhaincha (*Sebania aculeate*), glyricidia other leguminous crops etc and non leguminous crops like buck wheat, maize, sun flower etc. Leguminous crops containing different microorganism which can fix nitrogen to improve the soil fertility and plant growth.

What character should be in Ideal Green Manure crop?

A good green manure crop should have always following character:

- ✓ They should have deep root system
- ✓ They should have less nutrients requirement and fast growth system.
- ✓ They should have ability to fix atmospheric nitrogen so that it provides nitrogen to the plants.

Methods of Green Manuring

The practice of green manuring is performed in different ways according to suitable soil and climatic conditions of particular area. Broadly the practice of green manuring in India can be divided into two types- Green manuring in-situ and green manuring by collecting green leaves and twigs from some other places.

Green Manuring in situ

It can be defined as a system by which green manure crops are grown and incorporated into the soil of the same field that is to be green manured, either as a pure crop or an intercrop with main crop. Common green manure crops in this



system sunhemp(*Crotalariajuncea*) dhaincha (*Sesbania aculeate* and *Sesbaniarostrata*), guar (*Cyamopsistetragonoloba*), etc. (Dubey *et al.* 2015).

The following characters has been essential for the green manure in situ method :

1. Their crops was legume in which plant roots enough number make nodule which are fix nitrogen.
2. Water requirement is minimum for the crops.
3. Poor and onuse soil on good growth.
4. Grow in any soil and no profuse toxicity effect.

Ex situ green manuring

Green manuring through collection of green plant tissues from other places. It refers to turning into the soil green leaves and tender green twigs collected from outside the field to green leaves and tender green twigs collected from outside the field to be green manured. The common green manure crops are Glyricidia (*Glyricidia maculate*) Karanja (*Pongamia pinnata*) etc (Ambika *et al.* 2015).

Techniques of green manuring in the field

The maximum benefit from green manure crop cannot be obtained without knowing the :

1. Right time of sowing.
2. Right time of incorporating in the soil.
3. Time required for decomposition

a) Time of sowing of the green manure crop

The sowing of green manure done according to climate conditions of area and resources available. Normally, green manure crop is sown immediately after monsoon rains. But, if irrigation facility is available, green manure crop can be grown as catch crop after harvest of rabi crop during April and May (Sunhemp and Dhaincha).(Mishra *et al.* 1998).

b) Stage of burying of green manure crop

The specific stage is when plant is immature and has started flowering as the basic aim of green manuring is to provide maximum to compare to mature plant. Delay of even 15 – 20 days reduce nitrogen content and increase C:N ratio, fibre, hemicellulose, lignin making it difficult for soil microorganism to act and decompose (Yadav *et al.*, 2013).

III. EXPERIMENTAL RESULTS

Major role of Green manure in soil health

The under mentioned advantages have been ascribed to the green manure observed by Aiyelar, 2016.

Nitrogen Fixation

Green manures are often grown to add nitrogen to the soil. Almost all legume use rhizobia bacteria to fix nitrogen from the atmosphere. For good amount nitrogen fixation in soil, the correct strain of bacteria must be present. The various species of bacteria interact with different groups of legumes (Cloves, lucerne and lupins and beans). If the same types of plants are regularly grown then sufficient nodules. Sometimes it is worth inoculating the seeds with the correct type of bacteria. For effective fixation, a minimum soil temperature of about 7⁰ C is needed and the plants need to have adequate nutrients available to them. The amount of nitrogen fixed varies between difference species shown in table 2.

TABLE 1 SHOWING IMPORTANT CROPS AND THEIR EFFECTS ON YIELD

Green manure crop and their effect on Nitrogen					
Name	Botanical Name	Season	Average yield (Kg/ha)	N%	N in soil (Kg/ha)
Sunhemp	<i>Crotalaria juncea</i>	Kharif	212	0.43	75.0
Sesbania	<i>Sesbania aculeate</i>	Kharif	200	0.42	68.9

Nitrogen conservation

Large quantities of nitrate can be lost from soil when it is left bare overwinter. Green manure crop in nitrate conservation in soil.

Table 2: Representing the biomass production and nutrients accumulated by green manure crops

S.no	Crop	Dry matter in 45-60 DAS (q/ha)	Nutrient accumulation Major nutrients (kg)		
			N	P ₂ O ₅	K ₂ O
1	<i>Sesbania rostrata</i>	50.00	131.0	18.5	62.5
2	<i>Sesbania speciosa</i>	30.00	119.4	072	39.0
3	<i>Gliricidia maculate</i>	35.00	125.6	125.6	46.8
4	<i>Eichhornia juncea</i>	70.00	198.1	63.0	125.3
5	<i>Crotalaria juncea</i>	52.50	150.2	47.3	93.9

Making nitrogen available

Large amounts of nitrogen are added to the soil by a successful green manure. Vetch, which is a legume, is a plant which has a high nitrogen content throughout its life (3 to 4 % of its dry weight) and is consequently readily mineralised. It grows rapidly in the spring. In one trial it had accumulated 98 kg N/ha in late March, 132 kg/ha in mid April and 206 kg /ha by early May.

Effects on other soil nutrients

Some plants, particularly lupins and buckwheat, can increase phosphate mobility in the soil by the exudation of organic acid from the roots – in one study the uptake of phosphorus by lupins was ten times greater than that of wheat. This phosphorus will then be more readily available to subsequent crops after incorporation. Other green manures (for example chicory, with its deep tap root) have been reported to accumulate large amounts of sulphur, boron, manganese, molybdenum and zinc.

Effects on soil structure and properties

Green manure can improve soil structure in a number of ways:

1. Extensive fine roots enmesh the soil, helping to stabilise aggregates and increase pore size.
2. Some species (e.g. Lucerne, chicory and red clover) produce deep tap roots which help break up compacted soil.
3. Root exudates provide food for micro-organism, which in turn produce polysaccharide gums, that 'glue' soil aggregate together.
4. The root system has a binding effect on the soil, so water erosion is substantially reduced.
5. Increased organic matter can help to improve water holding capacity.

IV. CONCLUSION

Now day's world facing food problems so for increasing the food production farmers need more fertilizers for increasing their productivity. But another side green manure helps to balance the soil nutrients and making more available nutrients to plants. Biological activities of soil also changed with the help of green manures. So now days GM crops are very important for soil health.

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