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Role Of Green Manuring In Sustainable Agriculture: A Review

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Abstract: The declination of soil quality is a major concern nowadays. Due to the use of Green revolution techniques the production has increased to much extent but it has caused the detioration of the soil quality, degradation of land which ultimately affects the human health and environment. Accumulation of agrochemicals in the soil is decreasing the soil quality which also leads to less fertility of the soil. The use of green manures crops can restore the soil fertility, prevent soil erosion, improve physico-chemical properties of soil, maintain genetic balance; mainly they act as nutrient supply to the succeeding crops. They not only improve the physical, biological property of the soil but also protect the plants from diseases. Therefore, it helps in plant protection also. Various research papers, research activities of green manures are reviewed here for role of green manuring in sustainable agriculture.

Keywords: Green manures, land degradation, sustainable, soil fertility, soil quality.

1. INTRODUCTION:

Soil degradation is a major constraint to the higher production and growth of plants. The primary cause of soil degradation is the use of agrochemicals such as pesticides and fertilizers. The accumulation of the agrochemicals leads to the health hazards and environment pollution also. The detioration of soil quality includes loss of organic matter, accumulation of chemicals in the soil, loss of soil fertility, declination of the yield of the crop. Excess tillage, continuous cropping system and intensive use of agrochemicals will lead to the dark future of the agriculture. To finish the trend of soil degradation and to achieve the sustainable agriculture we need to follow the use of green manure, and vermi compost, compost, bio fertilizers, amrit jal, vermiwash etc. Green manuring is one of the best alternatives to improve the soil health and meet the nutritional of succeeding crop. The loss of nitrogen can be prevented by the incorporation of green manure crops in the soil. Green manure crops are mostly leguminous crop because they help in the fixation of the nitrogen by the use of *Rhizobium* . Most commonly used crops are dhiancha (*Sesbania aculeate*) , sun hemp , guar etc. The green manure crops check soil erosion, improve physico-chemical properties of soil, biological and provide plant protection. This review paper will tell us about the role of green manure crops in the sustainable agriculture. Through this review we have also come to know about the green manure technologies, characteristics of green manure crops, advantages of green manuring (soil improvement and disease management)(ChitraMani & Kumar, P. (2020); Sharma, M., & Kumar, P. (2020); Chand, J., & Kumar, P. (2020); Naik, M., & Kumar, P. (2020); Kumar, P., & Naik, M. (2020); Kumar, P., & Dwivedi, P. (2020).

Green manure crops: Green manuring is the practice of incorporating undecomposed green plants into the soil to maintain the nutrient supply to the succeeding crop. Green manuring is also known as the process of incorporating green plants into the soil which are raised in the same field or in the another field at green stage before flowering. Green manure technology helps in the nutrient supply, improves soil fertility, soil structure, water holding capacity of the soil, check soil erosion, and flourish the microbial population by the addition of humus and organic matter into the soil (Devi, P., & Kumar, P. (2020); Kumari, P., & Kumar, P. (2020); Kaur, S., & Kumar, P. (2020); Devi, P., & Kumar, P. (2020); Sharma, K., & Kumar, P. (2020); Kumar, S. B. P. (2020); Devi, P., & Kumar, P. (2020); Chand, J., & Kumar, P. (2020). This is practised according to the soil condition and the suitability of the soil. Green manure crops used are leguminous plants such as pigeon pea, green gram, ground nut, because they help in the fixation of the nitrogen by the use of *Rhizobium* . Most commonly used crops are dhiancha (*Sesbania aculeate*) , sunn hemp (*Crotolaria juncea*) , guar, senji (*Melilotus parviflora*), berseem (*Trifolium alexanderinum*), broadbean (*Vicia faba),* white lupin (*Lupinus albus)* blue lupin (*Lupinus angustifoilus*), yellow lupin (*Lupinus luteus*), lucerne or alfalfa (*Medicago sativa*), white clover (*Trifolium repens*), *Azadirachta indica, Cassia tora, Delonix regia, Delonix elata, Hibiscis viscose, Darris indica etc*. Legumes have the capacity to the fix the atmospheric nitrogen by forming the symbiotic relationship with the legumes. Rhizobium species has the capacity to fix the nitrogen into the soil according to the nutrient demand of the plant.

Characteristics of Ideal Green crop: An ideal green crop should have the following characteristics:

- They should have deep rooting system.
- They should have less nutrient requirement so that the main crop does not face the deficiency of nutrients.
- They should have quick growth so that the biomass production is fast.
- They should have less water requirement so that it does not compete with the main field crop for water uptake.
- They should have the ability to fix atmospheric nitrogen so that it provide nitrogen to the plant.
- It should produce more biomass so that more organic matter and more organic acids can be produced in the soil after the decomposition.

Some important facts of green manure crops:

- The green crops are sown in the month of May-June and they are ploughed down in the July. Mostly higher seed rate is recommended for green manure crops.
- Green crops should be incorporated into the field at the stage just before the flowering which is mostly at the age of 6-7 weeks.
- The time interval between the incorporation of green crops in the main field and the sowing of the succeeding crop depends on the weather conditions of the area and the nature of buried material. Mainly warm and humid weather is more favourable for the decomposition of the green crops.
- Dhiancha , a green manure crop, gives good results in the alkaline and water logging conditions of the soil.
- Sunn hemp is suitable for all types of soil and it can be used as green crop in all parts of the country.
- Rhizobium species has the capacity to fix the nitrogen into the soil according to the nutrient demand of the plant.

Green manure for improvement in the soil nutrient: Green manure crops helps in increasing the nutrient uptake efficiency, biomass of the microorganisms, water retention capacity and the organic matter in the soil. And it also leads to the reduction of the soil erosion nutrient. By the application of the high quality of green manure crops such as legumes which have low lignin content and low carbon to nitrogen ratio we can provide the nutrient more efficiently to the plant because the nutrient is released more quickly to the plant.

Green manure for disease management: A lot of soil borne pathogens survives in the rhizosphere and for continued period it survives in the soil and cause diseases. Green admixture reduces the ache accident required by the soil rhizome pathogens. Green manure crops affect the availability of various elements such as nitrogen, phosphorous, potassium, magnesium and zinc which is beneficial for the disease tolerance of the plants. Some Brassicaceae plants produce isothiocyanates which are volatile toxins, they kill the pathogens. Green manure crops which are incorporated in the soil release the toxin called isothiocyanate through the active hydrolysis process.

Physical properties of the soil: Green manuring improves the soil physical properties such as structure of the soil, soil bulk density, water retention capacity, texture of the soil, alters the porosity of the soil by decreasing the number of micropores and increasing the number of macropores. These properties change due to the addition of organic matter by the plants. Some green crops such as Sesbania produces cementing agent from various microbial activities. Sesbania have deep rooting system and it helps in the formation of the macropores in the soil (Kumar, P. (2019); Kumar, D., Rameshwar, S. D., & Kumar, P. (2019); Dey, S. R., & Kumar, P. (2019); Kumar et al. (2019); Dey, S. R., & Kumar, P. (2019); Kumar, P., & Pathak, S. (2018); Kumar, P., & Dwivedi, P. (2018); Kumar, P., & Pathak, S. (2018);

Chemical properties of the soil: Green manure crops help in the fixation of the atmospheric nitrogen by forming the symbiotic relationship with the legumes. Rhizobium species has the capacity to fix the nitrogen into the soil according to the nutrient demand of the plant. They fix the nitrogen in the roots by the formation of root nodules which provide ground to the Rhizobium present in the rhizosphere. The binding material present in the soil comes from the carbonic acid which is released from carbon dioxide after decomposition (Kumar et al.,2018; Kumar, P., & Hemantaranjan, A. (2017); Dwivedi, P., & Prasann, K. (2016). Kumar, P. (2014); Kumar, P. (2013); Kumar et al. (2013); Prasann, K. (2012); Kumar et al. (2011); Kumar et al. (2014).

2. CONCLUSION:

Green manuring is one of the best alternative to improve the soil health and meet the nutritional of succeeding crop. The loss of nitrogen can be prevented by the incorporation of green manure crops in the soil. Green manure crops are mostly leguminous crop because they help in the fixation of the nitrogen by the use of *Rhizobium* . Most commonly used crops are dhiancha (*Sesbania aculeate*) , sun hemp , guar etc. The green manure crops check soil erosion, improve physico-chemical properties of soil, biological and provide plant protection. By the use of green manuring we can have the sustainable agriculture and evergreen agriculture as it helps in the restoring the soil quality and prevents the degradation of the land.

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