International Journal of Science and Research (IJSR)
ISSN: 2319-7064
Impact Factor 2024: 7.101

Effect of Neem Oil Cack Manure Fertilization of Barren Soil on the Growth Performance of *Cassia Tora* Rhizospheric Soil Microbial Population

Mantasha Tasliha Abdul Haque[1], Kirti. V. Dubey[2]

[1]M.Sc. Microbiology, Sevadal Mahila Mahavidyalaya and Research Academy,
Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur, India
Email: *mantashahaque75[at]gmail.com*

[2]Department of Microbiology, Sevadal Mahila Mahavidyalaya and Research Academy,
Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur, India
Email: *kirtivijay_dubey[at]yahoo.com*

Abstract: ***Barren soils have insufficient nutrient availability and low microbial activity. resulting in stunted plant growth. Neem oil cake, a nutrient-dense by-product of Azadirachta indica, raise soil fertility and promote beneficial microbes. Overall, neem oil cake also acts as an eco-friendly biofertilizer that enriches barren soils, increased microbial diversity, and supported plant growth in general. In the present paper, the effect of neem oil cake manure amelioration of barren soil, its effect on the growth of Cassia tora, and rhizospheric microbial populations at different concentrations of neem cake in soil, together with soil nutrient status and microbial activity will be reviewed. However, llimited available literature has shown the prominent progress in soil organic carbon, available nitrogen, microbial biomass, and populations of beneficial microbes, that lead to boost in the growth and nutrient uptake in Cassia tora due to soil amelioration with neem oil cake.***

Keywords*:* Neem oil cake, cassia tora, Barren soil, Rhizospheric microorganism, Soil fertility, Microbial population, Sustainable agriculture, agricultural productivity.

1. Introduction

Soil is a fundamental natural resource for agricultural productivity, yet a large piece of land especially in India has become barren because of poor fertility, low organic matter, lower water retention, and limited microbial diversity. Such soils lack essential nutrients availability like nitrogen, phosphorus, potassium, and micronutrients, which restrict plant progress. Even though chemical fertilizers can provide short term supply nutrients, they fail to restore soil biology and may lead to long-term issues such as acidification, salinization, and decrease in microbial activity.

Barren soils are also lower in microbial biomass and enzymatic activity, which are necessary for nutrient cycling and organic matter decomposition. This imbalance cut-offs plant establishment, especially in species like *Cassia tora*, which depend on a healthy rhizosphere for increment and metabolite production. Thus, sustainable and eco-friendly strategies are needed to improve soil fertility, microbial populations, and plant performance without resting on chemical fertilizers. Neem oil cake offers a promising approach as it enriches soil along with slow-release nutrients, promotes microbial activity, and improves soil structure and moisture holding. *Cassia tora*, being hardy and able of improving soil health by its root exudates, complements neem cake application. Their combination is expected to increase plant growth, soil fertility (organic carbon, available NPK), and rhizospheric microbial activity.

This study determines the effects of neem oil cake manure on barren soil restoration, growth performance of *Cassia tora*, and amplification of rhizospheric microbial diversity, providing a sustainable model for repairing depleted lands.
Role of oil cake against soil-borne pathogen, was studied by Karmelreetha, *et al.*, (2020). Result showed that neem cake can be used as an eco-friendly biocontrol stimulator capable of lowering fungal and bacterial infections in the rhizosphere. The evidence confirms that neem-based amendments not only control soil pathogens but also boost microbial balance.

Lin, *et al*., (2017) have demonstrated that application of neem cake along with *Bacillus* species formulation to control *Fusarium oxysporum* in tomato plants. This worked as a carrier for beneficial microbes, which Increased the antagonistic activity and reduced soil-borne diseases in tomato plant.

Effect of different levels of FYM, neem cake, and *Rhizobium* on physicochemical properties of soil and growth of legumes was evaluated by Pavani., *et al.*, (2021) merged the results showed a notable enhancement in soil organic carbon, nitrogen content, and microbial respiration, indicating that neem cake integrated along with biological fertilizers boost soil health.

Impact of Neem seed cake on soil microflora and soil properties evaluated by Elastic., *et al*., (2011) has shown that neem seed cake amendments considerable enhanced populations of beneficial soil microorganisms like nitrogen fixers and phosphate solubilizers. The study also has shown increase in soil enzymatic activity, water-holding capacity, and pH balance of treated soil.

Effendy, *et al*., (2017) evaluated the effect of neem seed cake and NPK fertilizer on sesame. Rexult highlighted that neem

cake increased the growth parameters like plant height and leaf area while enhancing yield and improving soil fertility. Indicating that neem cake supplied a slow and sustained eco-friendly nutrient release facility which is beneficial for crop growth under low-fertility condition like barren soils.

Effect of Neem (*Azadirachta indica*) seed cake on growth and yield of *Okra* was evaluated by Effendy., *et al*., (2018). The role of neem seed cake as an organic fertilizer was evaluated for okra plants. The study has shown better germination rates, root elongation, and fruit yield compared to chemical fertilizers. Neem cake also supported raised microbial biomass and carbon content in the rhizosphere.

Selected chemical properties, microbial activity and biomass of soils amended with aqueous neem leaf extract were studied by Mweetwa, *et al*., (2016) and results have revealed that neem amendments significantly enhanced soil organic carbon, dehydrogenase, phosphatase activity, boosted soil fertility and microbial proliferation.

Use of Neem vegetable cake (*Azadirachta indica)* has resulted in increased corn productivity when neem cake was used as an organic fertilizer for maize. There was improved soil nutrient retention and yield performance. Neem cake promoted microbial respiration and nitrogen mineralization, and showed its effectiveness in restoring nutrient-deficient or barren soils (Sylvae *al.*2024).

Jadhav., *et al.,* (2016) have shown that neem cake amendment of soil has influenced by integrated nitrogen management for Banana field as there was improvement in the soil enzymes viz. catalase and dehydrogenase activity, soil carbon build-up, and microbial proliferation.

Effect of neem cake amended soil on reduction of damping-off severity and population densities of plant-parasitic nematodes and soil borne plant pathogens, was studied by Abbasi, *et.al*, (2005). Results have shown that amendment of soil with neem cake considerably decreased soil borne pathogens and nematodes, enhanced soil microbial environment, and improved soil health thereby supporting its potency for improving barren soil fertility and rhizospheric microbial activity.

Response of Senna plant (*Cassia sEnna L.)* to organic, mineral and microbial fertilization, was evaluated by Abd Allah, *et al.,* (2012). Rresults have shown that the application of organic manure along with microbial fertilizers significantly increased plant growth parameters, biomass production, and nutrient uptake. This study has aadditionally supported the idea that organic–microbial amendments can improve soil fertility.

Rresults of experiment on the eeffect of *cassia tora* leaf extract on the growth and yield characteristics of tomato and on the reproduction of root-knot nematodes in fly as amended soil, was evaluated by Azam *et al*., (2013). Results have revealed that *cassia tora* is an important medicinal plant having antiseptic, antidiarrheal, antioxidant, and antimutagenic, antimicrobial activity and also serves as a good natural source of fungicides.

2. Conclusion

The reviewed studies evidently indicate that neem oil cake is an impactful organic amendment for reclaiming barren soils. It reliably promotes soil organic carbon, nutrient availability, enzymatic activity, and beneficial microbial populations. These improvements build a healthy rhizospheric environment that supports healthier root development, nutrient uptake, and as a whole plant performance. For *Cassia tora*, neem cake fits well with the plant's adaptability to poor soils, further enhancing growth by enriched microbial interactions. As a result, neem oil cake manure serves as an environmentally sustainable solution for barren soil reclamation, improved growth performance of *Cassia tora*.

References

[1] Abd Allah, *et al*., (2012). Response of Senna plant *(Cassia Senna L.)* to organic, mineral and microbial fertilization. Journal of Agriculture and Biological Sciences.
[2] Abbasi, *et al.,* (2005). Effect of neem cake soil amendment on reduction of damping-off severity and population densities of plant-parasitic nematodes and soil borne plant pathogens. Canadian Journal of Plant Pathology.
[3] Zaimet *al.,* (2013). Effect of *cassia tora* leaf extract on the growth and yield characteristics of tomato and on the reproduction of Root-knot nematodes in fly ash amended soil.
[4] Efediyi, *et al.,* (2017). Effects of neem seed cake and NPK fertilizer on the growth and yield of sesame (*Sesamum indicum L.).*
[5] Efediyi, *et al.,* (2018). Effect of neem (*Azadirachta indica)* seed cake on growth and yield of okra.
[6] Elnasikh, *et al.,* (2011). Impact of neem seed cake on soil microflora and soil properties.
[7] Jadhav, *et al*., (2016). Soil enzyme activities, organic carbon and microbial population as influenced by integrated nitrogen management for banana.
[8] Karmelreetha, *et al.,* (2020). Role of oil cake against soil-borne pathogen and eco-friendly approach.
[9] Lin, *et al*., (2017). A formulation of neem cake seeded with *Bacillus sp.* provides control over tomato Fusarium crown and root rot.
[10] Mweetwa, *et al*., (2016). Selected chemical properties, microbial activity and biomass of soils amended with aqueous neem leaf extract.
[11] Pavani, *et al.*, (2021). Effect of different levels of FYM, neem cake, and Rhizobium on physicochemical properties of soil and growth of legumes.
[12] Silva, *et al*., (2024). Use of neem vegetable cake (*Azadirachta indica A. Joss)* increases corn productivity.