

Exploring Neem as a blessing for Natural farming

Abstract

This review explores the rich concept of natural farming and the diverse applications of neem in natural farming. Neem plant is considered as the most useful traditional plant in India. The various properties of different parts of neem tree are used mainly as insecticide, fertilizer, manure, soil conditioner etc. In recent era the major challenge is to increase the food production without harming the environment. Neem is considered as ecofriendly, biodegradable, least persistence and also economic. Neem based formulations forms a major component of Natural farming. Successful results of application of neem based formulations in natural farming will provide adoption of cost effective technology to the farming community.

Key words: *Azadirachta indica*, Neem, Natural farming, B:C ratio

Introduction

Natural farming is a chemical free traditional farming system which integrates crops, trees and livestock with functional diversity. The term 'Natural Farming' was introduced by Fukuoka, a Japanese Farmer and Philosopher in his book 'The One-Straw Revolution' in the year 1975 (De, 2022). Green Revolution technology transformed India from food scarce country to food surplus but also led to unfavourable influence like soil degradation, biodiversity losses, increasing cost of cultivation etc. Unjudicious application of chemical fertilizers and pesticides and declining crop productivity along with uncertain market conditions and climate change contributed into unremunerative agriculture. Natural Farming is supposed to be disruptive farm practices addressing significant apprehension of farmers of increasing cost of cultivation. It envisions ecological or regenerative agriculture that forbids application of any kind of chemicals to soil biosystems. By promoting multicropping, year round soil cover, addition of formulation containing cow dung and urines to activate the microorganisms in the soil system it depends more on soil biology than soil chemistry. By application of Jeevamritha, Beejamritha, mixed cropping system, home-made plant protection solutions and mulching, natural farming envisions a total chemical free farming (Kumar et al, 2020).

Plant description

Azadirachta indica (Neem), a tree that originated in India and Myanmar and because of its many health benefits referred as "The village pharmacy" or "Divine tree" (Islas et al., 2020). It is a small to medium-sized evergreen tree with thick, fissured bark that ranges in colour from dark gray to red (inside). Its sap is gummy and colorless. The leaves are glabrous pinnate, long (20–40 cm) and light green in colour. The flowers are fragrant and white or pale yellow in colour. The fruits are tiny (1–2 cm) in size and range in colour from greenish to yellow. The tree has extensive lateral roots and a deep tap root system (Usharani et al, 2019). It can reach up to a height of 12-24 m high at altitudes between 50 and 100 m and needs 130 mm of sufficient rainfall per annum to grow normally. Today Neem is acknowledged as a natural product with lot to offer in terms of resolving issues of global agriculture,

environment and public health. contain Compounds with demonstrated antiseptic, antiviral, antipyretic, anti-inflammatory, anti-ulcer and antifungal uses are found in the seeds, bark and leaves. Neem contains a variety of ingredients having therapeutic uses. Azadirachtin is the most significant component followed by nimbolinin, nimbin, nimbidin, nimbidol, sodium nimbinat, gedunin, salannin, and quercetin (Sharma and Vaquil, 2018). Considering Neem tree versatility as an adaptable tree species, it can be referred as “agroforestry tree of India” because of its great adaptability, diverse range and ability to provide an alternate income source to the villagers/rural poor. Owing to its adaptability in a variety of habitats and climatic conditions as well as its use in shelterbelts, Neem is regarded as important agroforestry tree species (Pande and Tarafdar, 2004).

Neem application in Natural farming

In India the neem based agroforestry system has been revived by the growing demand of natural farming concept. Neem can be used as manure, urea coating agent, soil conditioner, fumigant and also very beneficial in the management of crop and pest (Lokanadhan et al., 2012). Neem tree has become integral part of Natural farming due to its use in different components of plant protection (Sharma, 2022) and are as follows:

- a. **Neemastra:** Neemastra is used to prevent or treat diseases and to kill insects or larvae that eat plant leaves and suck plant sap. It helps in controlling the reproduction of harmful insects. Neemastra is exceptionally simple to prepare and is an effective pest repellent and bioinsecticide for Natural Farming. The inputs needed are 200 litre water, 2 kg cow dung, 10 litre cow urine, 10 kg fine paste of neem leaves along with short branches.
- b. **Brahmastra:** This is a natural insecticide is prepared from leaves that contain specific alkaloids to repel pests. All sucking pests and hidden caterpillars that are present in pods and fruits are controlled by it. The inputs needed are 20 litre Cow Urine, 2 kg Neem leaves along with short stems or branches, 2 kg Karanj leaves, 2 kg Custard Apple leaves, 2 kg Datura leaves, 2 kg Castor leaves, 2 kg Mango leaves and 2 kg Lantana leaves.
- c. **Agniastra:** It is utilized for controlling all sucking pests and caterpillars. The inputs needed are 20 litre cow urine, 2 kg neem leaves paste, 500 gm tobacco powder, 500 gm green chilli paste, 250 gm garlic paste.
- d. **Dashaparni** acts as substitute for Neemastra, Brahmastra, and Agniastra. It is used for controlling different types of pests and used depending on the level of infestation. Inputs needed are 200 litre water, 20 litre cow urine, 2 kg cow dung, 500 grams turmeric powder, 10 grams Asafoetida, 1 kg tobacco powder, 1 kg chilly pulp, 500 gram garlic paste, 200 gram of ginger paste. Neem leaves also forms a part of 10 leaves used in Dashaparni.

Case Studies

Publicizing natural farming's best practices and success stories is crucial to raising awareness, encourage adoption and fostering confidence among the farming community. Natural farming practices have been efficiently and successfully adopted by farmers across India. Numerous success stories of neem use in Natural farming practices has been documented in India (Patel et al., 2022). Shri Kothapalli Shiva Ramayya of Kadapa district sprayed neemastra, dashaparni and sour butter milk for

pests and disease control in his farm. Shri Maaganti Chandraiah of Krishna district used neemstra (2 times, 200 litre/ application, @20 Days After Transplanting & 40 Days After Transplanting) and sour butter milk (1 time, 8 litres in 150 litres of water, @30Days After Transplanting) for pest management in his crops. Smt T. Yamini of Nellore district who motivated women farmers to adopt natural farming sprayed neemstra 100 lit/acre at 25 days after transplanting. Shri Chauhan Vikramsinh Jesangbhai of Vadodara district cultivated vegetables through natural farming and prepared and used plant protection measures like neemstra, brahmastra, agniastra and dashparni extracts in his field. Shri Deda Ram of Pali district planted neem trees on farm boundary which provided soil with manure and acted as a raw material for preparing natural pesticides. Natural farming practices enhanced the income of the farmers as evidenced by higher benefit cost ratio. Smt Mupalla Nirmalamma of SPSR Nellore district has grown citrus in her natural farming with reduced cost of cultivation and higher yield (table 1). Sri B Ramakoteswara Rao of Kadapa district cultivated 22 different types of vegetables under natural farming and produced seeds on his own apart from reduced cost of cultivation (table 2). Sri Dixit B Patel of Sabarkantha district has successfully grown banana by following natural farming methods and sorted, graded, and sold produce directly to the end user (table 3).

Table 1: Comparison between natural farming and conventional farming under citrus

Parameter	Natural farming (0.4 ha)	Conventional farming (0.4 ha)
Crop	Citrus	Citrus
Cost of cultivation (₹)	18900	35100
Production (q)	48	45
Gross return (₹)	99100	76250
Net return (₹)	80200	41150
BC ratio	4.24	1.17

Table 2: Comparison between natural farming and conventional farming under vegetables

Parameter	Natural farming (0.4 ha)	Conventional farming (0.4 ha)
Crop	Vegetables	Vegetables
Cost of cultivation (₹)	14500	21800
Production (q)	32	29
Gross return (₹)	51800	47500
Net return (₹)	37300	25700
BC ratio	2.56	1.17

Table 3: Comparison between natural farming and conventional farming under banana

Parameter	Natural farming(0.4 ha)	Conventional farming(0.4 ha)
Crop	Banana(G-9)	Banana(G-9)
Cost of cultivation (₹)	40000	175000
Production (q)	100	70
Gross return (₹)	400000	380000
Net return (₹)	360000	205000
BC ratio	9.00	1.17

Challenges

There is a strong herbicidal or allelopathic activity in the extract of neem trees. Allelopathy is a biological phenomenon in which an organism produces one or more biochemicals that affect the growth, life cycle and reproduction of other organisms. These biochemicals are known as allelochemicals and can have beneficial (positive allelopathy) or detrimental (negative allelopathy) effects on the target organisms. Allelochemicals are present in almost all parts of the plant i.e. roots, stem, leaves and fruit (Vaithiyathan et al., 2014). The allelopathic activity of neem may be due to presence of Nimbolide B and nimbic acid B (Kato-Noguchi et al., 2014). Azadirachtin, the most toxic neem-derived compound, has high toxicity to fungi, particularly arbuscular mycorrhiza, that enhance plant growth by increasing available P in soil (Gopal et al., 2007). Soil microorganisms play a very key role in ecosystem processes, including the decomposition of organic matter and transport of major plant nutrients (Madigan et al., 2011). Azadirachtin has also been shown to reduce the number of soil and rhizosphere microorganisms (Sarawaneeyaruk et al., 2015).

Conclusion

The Food security we have now need to be maintained by sustainable and viable approaches for the future generations. Agro-ecological concept like Natural farming are becoming more and more important in the present context. Neem is a blessing for natural farming that aims to preserve the environment. Neem can be grown on the bunds of natural farming field and can recover and improve the productivity of wasteland. Neem trees on field bunds can function as an effective windbreak and can be grown along with fruit culture. Neem leaves makes an excellent mulch for conserving soil moisture and maintaining soil temperature and offers protection from plant diseases like anthracnose, rust, black spot and mildew. Thus neem trees being inexpensive and sustainable resource are essential to natural farming.

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