



Research Article

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Use of neem biopesticide for enhancement of protein content and minimizing the chemical pesticide residue in soyabean seeds

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ABSTRACT

In India about 68% of the total population depends upon agriculture for their livelihood. To guard the agricultural production from the pests, a variety of chemical pesticides are in use. Most of them are toxic. They kill the target pest but also harm the ecosystem seriously by killing a variety of desirable organisms. Most of these pesticides are non biodegradable. It is clear that once used, chemical pesticides exists somewhere causing serious harm to mankind and the ecosystem. Realization of the negative effect of the chemical pesticides the uses of biopesticides is being encouraged all over the world. In present studies it has been observed that biopesticides such as NEEM is capable of destroying only the target pest without harming other desirable organisms or without disturbing the ecological balance. Biopesticides are completely biodegradable. It has been also observed that soyabean grown by using organic farming and neem based pesticide have better quality i.e. better percentage of protein content and negligible pesticide residue. Also the yield has been found to be marginally better in the crop grown by organic farming method using neem pesticide. Thus bio pesticides and organic fertilizers represent some of the most significant crop protection tools that a grower has, to produce a quality crop without sacrificing on the yield.

Keywords: Biopesticides, Biodegradable, Chemical pesticides, organic fertilizers.

INTRODUCTION

In present studies it has been observed that biopesticides such as NEEM is capable of destroying only the target pest without harming other desirable organisms or without disturbing the ecological balance. Neem Biopesticides are completely biodegradable. In organic production systems, biopesticides represent some of the most significant crop protection tools that a grower has to produce a quality crop. Chemical pesticides had been widely used for reducing the estimated 45% gross crop loss due to pests, amounting to around Rs. 290 billion per annum (2000) [1]. More and more quantities of chemicals are used for agricultural intensification to feed an ever growing population. In fact, the pest induced loss is on the rise despite increasing usage of pesticides.

In spite of the claimed efficacy, the use of bio pesticides, however has remained very low due to a number of socio-economic, technological and institutional constraints. Nonetheless, rise in income levels due to a growing economy coupled with increasing awareness of health related effects of chemical pesticides has increased the demand of organic food. In view of this demand and the government's efforts to mitigate climate change, biopesticides are going to play an important role in future pest management programs as well as to protect the environment [2]. Neem (*Azadirachta indica juss*) a large evergreen tree is a native of India. Extract of neem possess pesticide property. It was reported by Sontake B.K. that advantage of using neem oil in combination with insecticides is to reduce the insecticide dosage without any significant loss in efficiency [3]. Azadirachtin A (I) was isolated from Neem seeds by Butterworth and Morghan [4], who reported complete inhibition of feeding of desert locust (*Schistocerca gregaria*). It was named Azadirachtin by them. Till date about 25 natural analogues of Aza. A are known to occur

in neem. Azadirachtin find application in pest management in soyabean, cotton, corn, potato and ornamental plants etc. Many countries including India have referred the use of Aza. A as the natural pesticide .[5]

Soyabean (*Glycine max* L.) occupies premier position among crops, being the most important source of both protein concentrates and vegetable oil, it also contains a good amount of mineral salts and vitamins. Soybean tops in the world production of both oil seeds and edible oil. World harvest of soybean is more than 50 per cent of the total world oil seed production. India ranks fifth in the world soybean production during last two decades, with present area of 9.67 million hectares and 9.73 million tonnes production. M.P is known as a soyabean state. Area under soyabean in M.P is nearly 55% of the national area.

Oil and protein content together accounts for about 60% of weight (protein about 40% and oil about 20%). The remainder consists of 35% carbohydrate and about 5% ash. [6]

This study has been carried out to see the effect of Neem based biopesticides on protein content of soyabean as well as to minimize the residual accumulation of the chemical pesticide. Since M.P is the Region of medium rainfall and hence it is well suitable for the growth of soyabean 9560, which is a kharif crop with ripening time 90- 95 days i.e medium timing crop and do not requires much rainfall period for ripening. This study will be helpful to improve the quality of soyabean (better protein content with minimum pesticide residue) by using the organic farming method and Neem based biopesticides, without harming the ecosystem.

EXPERIMENTAL SECTION

We have selected Soyabean since Soybean [*Glycine max* (L.) Merrill] is known as “Golden bean” and miracle crop of the 20th century. It is a kharif crop. It is a versatile and fascinating crop with innumerable possibilities of not only improving agriculture but also supporting industries.

Soyabean besides having high yielding potential (20-25 q/ha) also provides cholesterol free oil (20%) and high quality protein (40%). It is a rich source of amino acids, vitamins, minerals and fats. Its oil is also used as a raw material in manufacturing antibiotics, paints, varnishes, adhesives and lubricants etc. Soybean occupies a premier position among crops, being the most important source of both protein concentrates and vegetable oil.

We have selected JS-9560 variety. Its pod contains 3-4 seeds. This crop duration is 90 to 95 days. It has more than 80% production capacity; it is tolerant to pod shattering as well as best germination capacity (avg. 82%). The plant of JS 9560 has about 32 cm height, 4-6 branches, violet flowers, flowering days 36-45, 25-40 pods, days to harvest 90-105, seeds are yellow in colour & less shiny. [7]

Since M.P is the Region of medium rainfall and hence it is well suitable for the growth of soyabean JS-9560, which is a kharif crop with ripening time 90- 95 days i.e. medium timing crop and do not requires much rainfall period for ripening. [7]

We have selected Neem (*Azadirachta indica* juss) since it is a large evergreen tree and a native of India. Extract of neem possess pesticide property. It was reported by Sontake B.K. that advantage of using neem oil in combination with insecticides is to reduce the insecticide dosage without any significant loss in efficiency [3].

Numerous scientific studies shows that, extract of neem fruits, seeds, seed kernel extract, twigs, stem bark and leaves posses Antifeedant, Insecticidal, Insect growth disrupting, Nematicidal, Fungicidal, Bactericidal, Anti inflammatory properties.

For the cultivation of soya bean crop for our practical work we have selected the land of Narela Shankari, Bhopal, MP. Since its soil is suitable for the growth of soyabean crop. Soyabean crop is already being cultivated in this area. We have taken a plot and divided it into 3 equal parts. One part is selected and prepared for the growth of soyabean with Organic method. Other part is selected and prepared for the growth of soyabean by Conventional Method and the third part is selected and prepared for the growth of soyabean by the Control method.

In our practical work we have cultivated soyabean crop by three different methods in three different years i.e. 2009, 2010, 2011.

The three different methods are as follows:

(1) Organic farming method: By using Nadep compost, vermi compost and neem based biopesticides (Neem baan, Paanch patti kadha).

(2) Conventional farming method: By using Urea, potash, DAP, super and synthetic chemical pesticide (Triazophos).

(3) Control method: Without using any fertilizer and pesticide.

After harvesting the soyabean crop, chemical **analysis** of soyabean seeds have been done to see the:

1. Impact of Organic fertilizers with neem based biopesticides on seeds .
2. Impact of Chemical fertilizers with chemical pesticides on seeds.
3. Impact of control method on seeds.

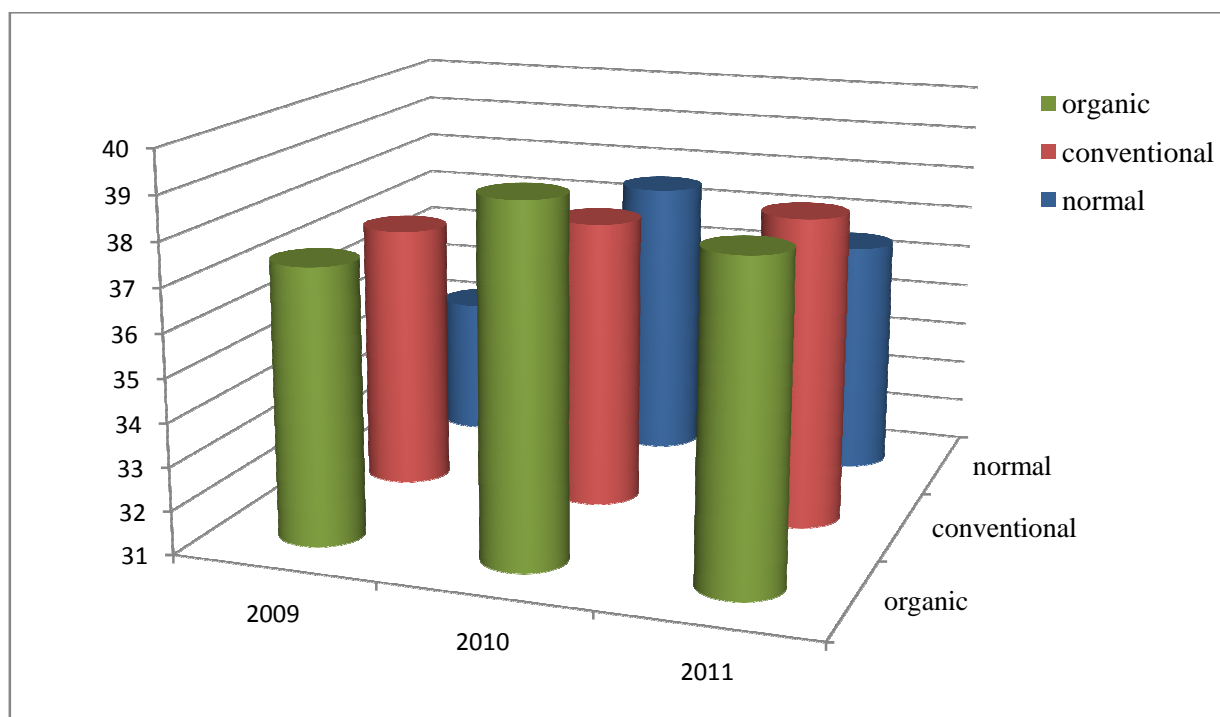
RESULTS AND DISCUSSION

The results of the percentage of protein content in 100 gms of soyabean seeds and the percentage of the chemical pesticide residue in the soyabean seeds grown by different methods in three different years are summerised in the following table:

PROTEIN ANALYSIS OF SEEDS

YEAR	SAMPLE		
	ORGANIC	CONVENTIONAL	CONTROL
2009	37.33	37.13	34.22
2010	39.12	37.65	37.55
2011	38.33	38.12	36.45

GRAPHICAL REPRESENTATION

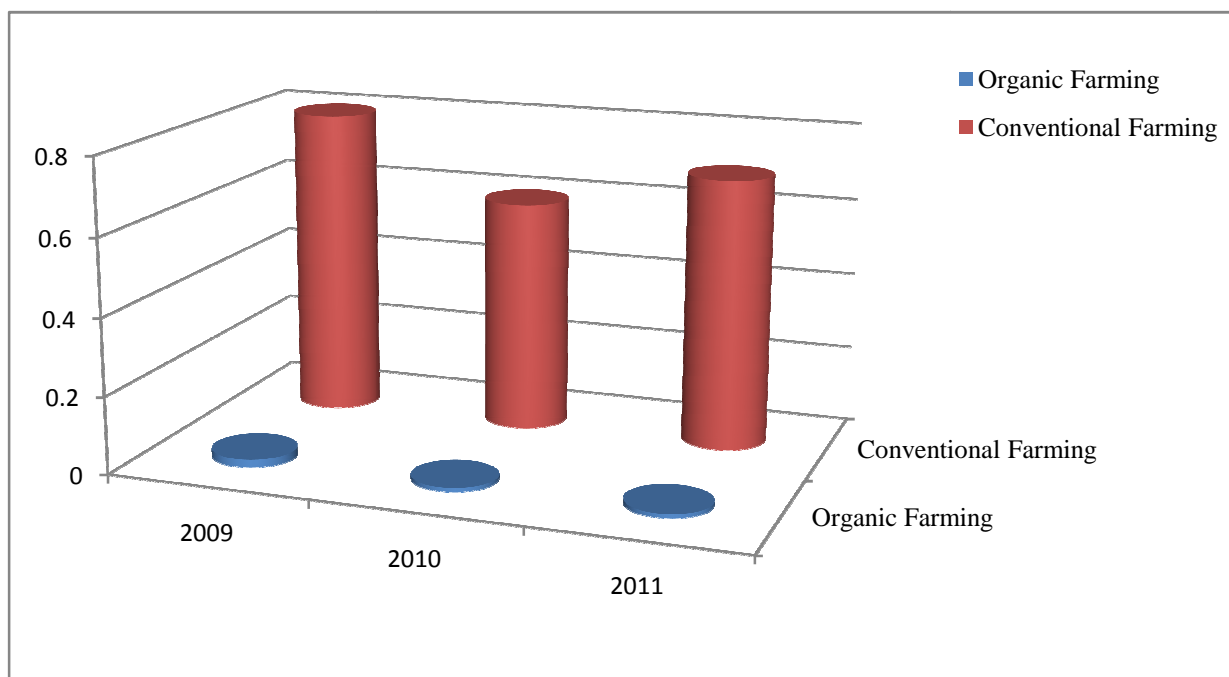


Graph: Protein content in soyabean 9560 sample

PESTICIDE RESIDUE ANALYSIS OF SEEDS

Year of cultivation	Organic Farming	Conventional Farming	Control Farming
2009	0.02 ppm	0.8 ppm	--
2010	0.01 ppm	0.6 ppm	--
2011	0.01 ppm	0.7 ppm	--

GRAPHICAL REPRESENTATION



DISCUSSION

From the results of protein content of soyabean seeds obtained by the Khyati Foods Private Ltd., Bhopal (M.P.) shows that the protein content of the seeds obtained by the organic farming method using neem based bio-pesticide is better (In the year 2009-37.33%, 2010-39.12%, 2011-38.33%) than the protein content of the soyabean seeds obtained by the conventional method (In the year 2009-37.13%, 2010-37.65%, 2011-38.12%). Seeds grown by the control method possess least content of protein. These results are comparable to the findings of Patil et al [8].

However, the results of protein content in organic seeds and conventional seeds are comparable. There is difference of few decimal points only. Hence it is apparent that organic farming method by using neem based pesticide is the best option to get the soyabean seeds with better protein content which is good for health.

As per the results given by the Choksi laboratories Ltd. the pesticide residue is negligible i.e. 0.02 ppm in 2009, 0.01 ppm in 2010, 0.01 ppm in 2011 in the seeds grown by the organic farming method using neem baan and paanch patti kadha as biopesticides, whereas the pesticide residue in the soyabean seeds grown by the conventional method is found to be 0.8ppm, 0.6ppm and 0.7ppm during the years 2009, 2010 and 2011 resp.. Negligible pesticide residue means no adverse effect of chemical pesticide on human health. In addition to this by using biopesticides we can protect our environment from chemical pollution.

Today's consumers are very health conscious and aware of the hazardous effect of chemicals in food product. Growers, farm advisors and government regulators are addressing these perceptions by adopting IPM to reduce total chemical residue levels on harvested crops and to produce good organic food. Listening to the demands of customers, several multinational grocery stores and food processing companies are already requiring lower pesticide residues than the current government-mandated Maximum Residue Limits.

For growers, food retailers, and consumers alike, this means that biopesticides can be used to reduce the number of chemical pesticides used to manage pests without sacrificing food safety or quality.

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