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RESEARCH ARTICLE

CHEMICAL PESTICIDES USE PATTERN OF BRINJAL GROWERS IN NADIA DISTRICT OF WEST BENGAL

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ABSTRACT

The rapid increase in consumption of pesticide to improve the production and productivity to feed the growing population, leads us to a number of issues which needs attention in recent times. Pesticides should be used judiciously in view of its high social cost as environmental pollution associated with its consumption, production and distribution. Though environmental considerations would warrant the considerations of use of proper pesticides at proper time and time interval in proper doses, the farmers are concerned with private profitability which is not eco friendly and detrimental to the human race. Agriculture is of outmost importance for the vast number of people of this country as it is the largest component of India's economic life. Since crop production is being influenced by a large number of factors, it is often impossible to measure all possible factors in every crop management unit. But some of these factors need attention in recent times for betterment of our environment. Agriculture being the backbone of Indian economy has a crucial role to play in the country's economic development. India ranks second worldwide in farm outputs and as a predominant rural economy it shares 50 percent of its work force in agriculture and contribution of agriculture in Indian economy is 18 percent. Farmers who are cultivating vegetables, they are using maximum numbers and amount of pesticides compared to cereal crops per unit area. Plant protection is an exercise basically followed in any crop for control of insect-pests, diseases, weeds etc. to avoid economic losses. For proper application of pesticides –there are specific recommendations. Due to lack of awareness of farmers regarding those recommendations, they are using pesticides deviating its proper processes and considerations. As a result, they are facing health related problems. Keeping all these in view the present study was designed with objective to know the chemical pesticides use pattern of brinjal growers in nadia district of West Bengal. The present study was conducted in Nadia district of West Bengal. Nadia district was purposively selected for the study. Under Kalyani sub-division of this district, Chakdah community development block was selected randomly for the study. Under this block, Rautari gram panchayat was selected randomly from all the gram panchayats. Under Rautari gram panchayat, three villages namely Teghara, Ruppur and Rameswarpur were selected purposively as the villages were in close proximity. Complete enumeration of the farmers in the villages was attended. Farmers who were available up to three times were included in the sample. In this way 73 brinjal growers from Teghara, 62 pointed gourd growers from Ruppur and 69 cauliflower growers from Rameswarpur were selected for the study who grow crops in parcels of plots under bigger common field . In this way total 204 respondents were selected. For the present study, we will consider only 73 brinjal growers. From the present study it was clear that brinjal crop is a round the year crop. Majority of the respondents (56.16%) applied pesticide 4-7 days interval. Brinjal growers usual utilization of amount of water for spraying pesticides at seedling stage of brinjal crop was 20-30 litres per bigha and it was reported by 83.56 percent of respondents. Similarly at mature stage of brinjal crop, majority of brinjal growers (87.67%) used 100-140 litres of water per bigha for spraying pesticides. The four major insect-pests of brinjal crop were (1) Brinjal shoot and fruit borer (2) white fly (3) mite and (4) aphid. Out of it, Brinjal shoot and fruit borer was most harmful insect-pest and cent percent of respondents (100%) reported it. Major diseases of brinjal crop were –(1) fruit rot (2) phomopsis blight (3) brinjal anthracnose (4) leaf spot and (5) damping off. Out of it, fruit rot was the most damaging disease of brinjal crop and it was reported by 61.64 percent of brinjal growers. Insect-pests and diseases both mainly attacked the brinjal crop at mature stage. For controlling the insect-pests and diseases of Brinjal crop, brinjal growers used many chemicals with their doses. To avoid the unnecessary use of pesticides, regulations regarding the use or pesticides and proper verification of the procedure should be carried out. Creation of awareness on the basis of family based training, sensitization through value and ethics based capacity building and utilization of religious and community leaders in this regard may be useful to overcome the issue. Therefore, the base level extension agencies should take proper measures on the basis of findings of the study to make their further extension programme more effective and steps should be taken to change the perception of the brinjal growers regarding the use of the safety measures.

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INTRODUCTION

Agriculture is fundamentally important to the Indian economy, serving as its backbone. It provides livelihoods for a large portion of the population, contributes significantly to the GDP, and is crucial for national food security. Furthermore, agriculture supplies raw materials for various industries and influences trade and rural development. Simply, agriculture is not just an economic activity in India; it's deeply intertwined with the social, cultural, and environmental fabric of the nation. The Indian economy is an agro-economy and depends highly on the agricultural sector. Despite just supporting the Indian Economy, the agricultural sector also supports the industrial sector and international trade in imports and exports. Although the contribution of the Agricultural Sector to the Indian Economy is reducing, it is the sector with the most number of people working in it around the country. When someone says "agriculture," we usually picture lush green fields, a hardworking farmer, maybe even a tractor ploughing through the soil. But did you know that agriculture contributes around 15-18% of India's GDP? That's no small number. And yet, this number doesn't even begin to cover the real impact of agriculture in the Indian economy. More than 50% of India's workforce is directly or indirectly employed in the agricultural sector. Agriculture also fuels several other sectors, like food processing, textiles, and even pharmaceuticals. Without agriculture, these industries would be standing on shaky ground. If you've ever eaten rice, worn cotton, or used turmeric in your skincare routine, you've already experienced the importance of agriculture in Indian economy firsthand. In India, farming is more than just a job. It's a way of life, a tradition passed down through generations, and honestly, a whole lot of hard work under the sun. It isn't just about fields and tractors—it's about food security, rural development, economic backbone, and even cultural identity. From the smallest tribal hamlet to the bustling cities, agriculture silently powers every aspect of our daily lives. More than half of India's population still depends on agriculture for their livelihood. Think about that—millions of families waking up before dawn, not to sit in air-conditioned offices, but to toil in fields that feed the entire nation. It's humbling, isn't it?.

Plant protection is crucial in India for ensuring food security, economic stability, and environmental sustainability. By minimizing crop losses due to pests and diseases, plant protection measures like Integrated Pest Management (IPM) and plant quarantine help maximize agricultural productivity and maintain the quality of agricultural produce. Chemical crop protection products, commonly referred to as pesticides or agrochemical products, play a vital role in controlling the pests and diseases that infect, consume or damage crops thereby significantly reducing the quantity and quality of food production, while the benefits of agricultural innovation goes to farmers and consumers. Chemical crop protection products or "pesticides" help control insects, diseases, weeds, fungi and other undesirable pests. It is estimated that annual crop losses could double without the use of crop protection products. Based on the type of pesticide, the pesticide market is classified into fungicides, herbicides, insecticides, and others. On the basis of the type of crop, the pesticides market has been categorized into cereals, fruits, rice, corn, nuts, soyabean, cotton, vegetables, and others. The pesticides market will witness robust growth in the vegetables, fruits, and nuts segment. Synthetic pesticides have been extensively used in the country for alleviating the estimated 45% gross loss of crops due to infestation of pests and diseases. In your agriculture land, you might find various pests like insects, disease-causing pathogens, nematodes, rats, birds, etc. who can come and feed on your plants and damage the crop.To protect your plant from the damage caused by these pests, crop protection is important. If the farmer fails to take any measures, the pests might damage the plant and it would ultimately result in lower yield. According to the Food and Agriculture Organization of the United Nations, if farmers stop implementing crop protection methods, they will immediately lose about 40 percent of the crop due to pests and plants diseases. Plant protection may be defined as the adoption of measures to prevent damage to plants from pests, or to arrest, minimize or obliterate it, once it has occurred. It includes the use of physical, mechanical, cultural, biological, chemical and legal measures to control pests. Plant protection is an exercise basically followed in any crop for control of insect-pests, diseases, weeds etc. to avoid economic losses. Reports indicate that the losses range from 20-30% by each of the insect-pests, diseases and weeds, but on an overall estimation, about 30% average cumulative loss by them appears a fair estimate. This resulted in taking suitable control measures to keep these losses to the minimum (Muthuraman and Kumar, 2013). One of the important plant protection measures is the use of pesticides. The term pesticide encompasses all chemical substances used for the control of pests. According to usage they are classified as insecticides, fungicide, herbicide, molluscicides and antibiotics. Most pesticides are used to serve as crop protection products which in general, protect the plants from weeds, fungi, or insects.

The economic implications of the crop damage and crop loss due to pest incidences have forced many Indian farmers to adopt frequent pesticide applications. Pesticides are considered responsible for the agricultural growth as its benefits associated with improved crop yields. That is the reason behind extensive use of pesticides. It has taken place in the last few years. The unnecessary use of pesticide to meet the ever rising quest for higher profit has resulted in several ecological and environmental consequences as well as unsafe practices in farming sector. The percentage of pesticide used on vegetable crops in the country is regularly increasing for the years. From 13-14% of the total pesticide use in the 1990s (Sardana, 2001) it has reached to 21% in 2010-11. Vegetables are very common diet of Indians in general. As a result of this, the quality of vegetables we eat is a big factor regarding our health issues. So, we need to understand the pesticide use pattern followed by the vegetable growers. The use pattern will reflect the knowledge of the vegetable growers regarding the spraying mechanism, proper doses, time of spraying and time interval needed to be followed while spraying pesticides, awareness regarding type of damage; identification of pest and proper plant protection measures. Keeping all these in view the present study is designed to have an assessment of brinjal growers pesticides use pattern. Therefore, the objective was – to portray the pesticides use pattern of brinjal growers in Nadia district of West Bengal.

MATERIALS AND METHODS

The present study was conducted in Nadia district of West Bengal. Nadia district was purposively selected for the study. Under Kalyani sub-division of this district, Chakdah community development block was selected randomly for the

study. Under this block, Rautari gram panchayat was selected randomly from all the gram panchayats. Under Rautari gram panchayat, three villages namely Teghara, Ruppur and Rameswarpur were selected purposively as the villages were in close proximity. Complete enumeration of the farmers in the villages was attended. Farmers who were available up to three times were included in the sample. In this way 73 brinjal growers from Teghara, 62 pointed gourd growers from Ruppur and 69 cauliflower growers from Rameswarpur were selected for the study who grow crops in parcels of plots under bigger common field.

In this way total 204 respondents were selected. But, for the present study will consider only 73 brinjal growers. The reason for selecting the area was • Nadia district is one of the leading vegetable growing areas of west Bengal. • Farmers were habituated in handling different pesticides. • Acquaintance with the local people and language. • The respondents were highly cooperative and responsive. • The concerned areas were easily accessible in terms of transportation for the researcher. •

The area was homogeneous in respect of socio-cultural and biophysical conditions which have bearings on crop cultivation in general and plant protection in particular. Pesticide consumption has close relationship with pest and disease infestation. Within a close proximity pest infestation is relatively homogeneous in nature. To maintain this homogeneity in micro climatic condition the areas with close proximity were selected.

RESULTS AND DISCUSSION

Chemical pesticide usage pattern in brinjal crop

Table 1. Season of brinjal cultivation (N=73)

Season	Number of respondent cultivated	Percentage of respondent cultivated
Kharif	16	21.91
Rabi	46	63.01
Summer	11	15.07

Season of brinjal cultivation: Season of brinjal cultivation is depicted in Table 1. From the study, it can be concluded that most of the respondents (63.01%) cultivated the crop in rabi season. At the most 21.91 percent of respondents cultivated it in kharif season and remaining 15.07 percent of respondents cultivated it in summer or pre-kharif season. From the study it is evident that brinjal is a round the year crop.

Table 2. Interval of applying pesticides (N=73)

Days interval	Number of respondent applied	Percentage of respondent applied
1 - 3	5	6.85
4 - 7	41	56.16
8 - 15	24	32.88
More than 15	3	4.11

Interval of applying pesticides: Interval of spraying pesticide is depicted in Table 2 Respondents of the study area applied chemical pesticides in the following days' interval- 1-3 days (6.85%), 4-7 days (56.16%), 8-15 days (32.88%) and more than 15 days (4.11%).

Table – 3. Amount of water used for spraying pesticides (N=73)

Crop stage	Litre of water required for spraying (per bigha) (1 bigha=33.33 dismil)	Number of respondent followed	% of respondent followed
Seedling stage	20 – 30	61	83.56
Maturity stage	100-140	64	87.67

Amount of water used for spraying pesticides: Amount of water used by the respondents is presented in Table 3. Majority of the respondents (83.56%) used 20-30 litres of water per bigha for applying of chemical pesticide at seedling stage and at maturity stage, maximum number of respondents (87.67%) used 100-140 litres of water per bigha for spraying chemical pesticides.

Table 4. Various insect-pests of brinjal (N=73)

Insect-pests of brinjal	Number of respondents reported	Percentage of respondents reported
Brinjal shoot and fruit borer	73	100
White fly	43	58.90
Mite	29	39.73
Aphid	26	35.62

Various insect-pests of brinjal: Various insect-pests of brinjal are depicted at Table 4. All the insects that cause damage to brinjal crop in the study area are described in the Table 4. There are a number of insect-pests that attack brinjal and cause severe damage to the crop. Among all these insects brinjal fruit and shoot borer is the most common and devastating pest of brinjal.

Table 5. Diseases of brinjal (N=73)

Various diseases of brinjal	Number of respondents reported	Percentage of respondents reported
Fruit rot	45	61.64
Phomopsis blight	38	52.05
Brinjal anthracnose	40	54.79
Leaf spot	33	45.21
Damping off	21	28.77

Diseases of brinjal: The most common diseases prevailing in the area are stated in Table 5. Brinjal is affected by various kind of diseases among which fruit rot, Phomopsis blight, brinjal anthracnose, leaf spot and damping off are some devastating ones. Damping off disease starts attacking from the juvenile stage.

Table 6. Attacking stages of insect-pests in brinjal

Insect-pests	Attacking stages of crop
Brinjal shoot and fruit borer	Early to mature stage
White fly	All the stages
Mite	Mature stage
Aphid	Flowering stage onwards

Table 7. Attacking stages of various diseases in brinjal

Diseases	Attacking stages of crop
Fruit rot	Early mature stage
Phomopsis blight	Seedling to mature stage
Brinjal anthracnose	Any growth stage
Leaf spot	Early stage
Damping off	Seedling stage onwards

Table – 8: Chemical pesticides used to control brinjal shoot and fruit borer (N=73)

Brand Name	Chemical name	Number of respondents adopted	Percentage of respondents adopted	Dose applied (per litre of water)
Delegate	Spinetoram 11.7 SC	11	15.07	1 ml.
Kirtap	Cartap Hydrochloride 50 SP	9	12.33	1 – 2 gm.
Confidor	Imidacloprid 20 SL	8	10.96	0.2 – 0.5 ml.
Emstar 5	Emamectin benzoate 5% SG	14	19.18	0.5-1 gm.
Carina	Profenophos 40 EC+ Cypermethrin 4 EC)	13	17.81	1.3-2.6 ml
Spintor	Spinosad 45SC	13	17.81	0.2 – 0.5 ml.
Fluton	Flubendiamide 20% WG	5	6.85	1 gm

Table 9. Chemical pesticides used to control white fly (N=43)

Brand Name	Chemical name	Number of respondents adopted	Percentage of respondents adopted	Dose applied (per litre of water)
Ekalux	Quinalphos 25 EC	14	32.56	2-6 ml
Rogor	Dimethoate 30 EC	9	20.93	2 ml.
Ghatak	Triazophos 40 EC	12	27.91	1.5-3 ml
Token	Dinotefuran 20 SG	8	18.60	0.25 gm.

Table 10. Chemical pesticides used to control mite (N=29)

Brand Name	Chemical name	Number of respondents adopted	Percentage of respondents adopted	Dose applied (per litre of water)
Kelthane	Dicofol 18.5 EC	14	48.28	3 ml.
Ethion	Met-505	7	24.14	1.50 ml.
Furadan	Carbofuran 3 G	5	17.24	3 kg/bigha
Success	Spinosad 45SC	3	10.34	0.2 – 0.5 ml.

Table 11. Chemical pesticides used to control aphid (N=26)

Brand Name	Chemical name	Number of respondents adopted	Percentage of respondents adopted	Dose applied (per litre of water)
Nuvan	Dichlorvos 76 SL	7	26.92	0.5 – 0.75 ml.
Rogor	Dimethoate 30 EC	5	19.23	2 ml.
Ekalux	Quinalphos 25 EC	4	15.38	2 – 6 ml.
Metasystox	Oxydemeton methyl 25EC	10	38.46	2 ml.

Table 12. Chemical pesticides used to control fruit rot (N=45)

Brand Name	Chemical name	Number of respondents adopted	Percentage of respondents adopted	Dose applied (per litre of water)
Kavach	Chlorothalonil 75 WP	19	42.22	2 gm.
Blitox	Copper Oxychloride 50 WDP	16	35.56	3 – 4 gm
Bavistin	Carbendazim 50 WP	10	22.22	0.5 gm.

Table 13. Chemical pesticides used to control phomopsis blight (N=38)

Brand Name	Chemical name	Number of respondents adopted	Percentage of respondents adopted	Dose applied (per litre of water)
Bavistin	Carbendazim 50 WP	14	36.84	0.5- 1gm.
Dithane M-45	Mancozeb 75 WP	13	34.21	2 -3 gm.
Indofil Z-78	Zineb 75 WP	5	13.16	1 – 2 gm.
Bordeaux mixture	Copper sulphate	6	15.79	5 – 10 ml.

Table 14. Chemical pesticides used to control brinjal anthracnose (N=40)

Brand Name	Chemical name	Number of respondents adopted	Percentage of respondents adopted	Dose applied (per litre of water)
Blitox	Copper Oxychloride 50 WDP	16	40.00	3 – 4 gm
Dithane M-45	Mancozeb 75 WP	13	32.50	2 -3 gm.
Kavach	Chlorothalonil 75 WP	11	27.50	2 gm.

Table 15. Chemical pesticides used to control brinjal leaf spot (N=33)

Brand Name	Chemical name	Number of respondents adopted	Percentage of respondents adopted	Dose applied (per litre of water)
Kavach	Chlorothalonil 75 WP	19	57.58	2 gm.
Bavistin	Carbendazim 50 WP	11	33.33	0.5- 1gm.
Indofil Z-78	Zineb 75 WP	3	9.09	1 – 2 gm.

Table – 16. Chemical pesticides used to control damping off (N=21)

Brand Name	Chemical name	Number of respondents adopted	Percentage of respondents adopted	Dose applied (per litre of water)
Krilaxyl-72	Metalaxyl 8%+ ancozeb 64% WP	8	38.10	2 gm.
Thirox	Thiram 75 WS	13	61.90	2 gm./ kg seed

Brinjal shoot and fruit borer (*Leucinodes orbonalis*): The chemical pesticides used to manage this disease are stated in Table 8. Larva of the insect burrows into the petioles and tender shoots. It results in drooping of leaves and shedding of flower buds. Severe damage is caused by caterpillars as they tunnel inside the fruit. The tunnel is filled with excreta. Srivastava & Dhaliwal (2013) reported that when the catterpillar attack the terminal shoots, the growing plants are killed. Damage to the fruits, particularly in the autumn,is very severe and it is not uncommon to see the whole of the crop destroyed by the borers.

White fly (*Bemisia argentifolii*): The chemical control measures are depicted in Table 9. The pest sucks enormous amount of sap. Black shooty mould develops over the honey dew lowering photosynthetic activity and makes fruit unattractive. The pest is generally found underside of the leaves.

Mite (*Tetranychus urticae*): The control measures followed by the respondents to prevent the insect are given in Table 10 Leaves which are affected by the insect become reddish brown and bronzy. In case of severe infestation larvae silken webbing appears on the leaves. Leaves become wither and dry. Flower and fruit formation affected. Eggs are laid in mass.

Aphid (*Myzus persicae*): The pesticides used by the respondents to deal with the pest are presented in Table 11. In case of the pest infestation yellow, angular spots restricted by veins resembling mosaic mottling appears on the upper surface of the leaves. The corresponding lower surface shows a purplish downy growth in moist weather. The spots turn necrotic with age.

Fruit rot (*Phytophthora nicotianae*): The chemical control of the disease is presented in Table 12. The disease develops in high humidity. The symptoms first appear as small water soaked lesions on the fruit, which later enlarges in size considerably. Skin of infected fruit turn brown and develops white cottony growth.

Phomopsis blight (*Phomopsis vexans*): The pesticides used to control the disease are given in Table 13. It is a serious disease of brinjal which infects the foliage and the fruits. Small circular spots appear in the infected leaves which become grey to brown with irregular blackish margins. Lesions may also develop on petiole and stem, causing blighting of affected portion of the plant. Symptoms on the infected fruits appear as minute, sunken, dull and dusky spots which later merge to form rotten areas. The flesh of severely infected fruits rot.

Brinjal anthracnose (*Colletotrichum coccodes*): The chemical control measures followed by the respondents are given in Table 14. In this disease, round, sunken spots appear on the green and ripe fruit which is in contact with the soil. Some infections form cankers on twigs and branches. Blight type symptoms of various colour appears on the leaves.

Brinjal leaf spot (*Cercospora melongenae*): The control measures are stated in Table 15. The disease symptoms are characterized by chlorotic lesion, angular to irregular in shape, later turning greyish-brown. Severely infected leaves drop off prematurely, resulting in reduced fruit yield.

Damping off (*Pythium spp., Phytophthora spp., Rhizoctonia spp.*): The control measures followed by the respondents are presented in Table 16.The disease causes severe damage in the nursery. High soil moisture and moderate temperature along with high humidity especially in the rainy season leads to the development of the disease. The pre-emergence damping off results in seed and seedling rot before these emerge out of the soil. The post-emergence damping off phase is characterized by infection of the young, juvenile tissues of the collar at the ground level. The infected tissues become soft and become water soaked. The collar portion rots and ultimately the seedlings collapse and die. Singh (2014) reported that seed and seedlings of almost all kinds of vegatables, cereals, and fruit and forest trees are affected by this disease. They are completely destroyed quite frequently by damping off, or they die soon after they are transplanted in seed beds or fields.

CONCLUSION

From the present study it was clear that brinjal crop is a round the year crop. Majority of the respondents (56.16%) applied pesticide 4-7 days interval. Brinjal growers usual utilization of amount of water for spraying pesticides at seedling stage of brinjal crop was 20-30 litres per bigha and it was reported by 83.56 percent of respondents. Similarly at mature stage of brinjal crop majority of brinjal growers (87.67%) used 100-140 litres of water per bigha for spraying pesticides. The four major insect-pests of brinjal crop were (1) Brinjal shoot and fruit borer (2) white fly (3) mite and (4) aphid. Out of it, Brinjal shoot and fruit borer was most harmful insect-pest and cent percent of respondents (100%) reported it. Major diseases of brinjal crop were –(1) fruit rot (2) phomopsis blight (3) brinjal anthracnose (4) leaf spot and (5) damping off. Out of it, fruit rot was the most damaging disease of brinjal crop and it was reported by 61.64 percent of brinjal growers. Insect-pests and diseases both mainly attacked the brinjal crop at mature stage. For controlling the insect-pest Brinjal shoot and fruit borer, brinjal growers used many chemicals i.e. Delegate, kirtap, confidor, emstar-5, carina, spintor and fluton. Due to shoot and fruit borer's inner side position of the insect-pest, to control it, was a difficult task. For controlling white fly, they used Eakalux, Rogor, ghatak and Token pesticide. Out of it Eakalux was comparatively effective and at the most 32.56 percent of respondents used it. Brinjal growers used kelthane, Ethion, furadon and success chemical pesticides to control mite. Out of these chemicals, kelthane was most effective and it was reported by nearly half of respondents (48.28%) of the study area. Nuvan, Rogor, Eakalux and metasystox were the chemical pesticides those were used to control aphid in brinjal crop by the farmers. Metasystox was most effective chemical to control mite and it was reported by 38.46 percent of respondents. Actually aphid is a sucking pest, for sucking pest systemic pesticides give good result. Metasystox is a systemic pesticide. The chemical used to control the disease fruit rot were kavach, blitox and bavistin. The percent of respondents

used were the Kavach (42.22%), Blitox (35.56%) and Bavistin (22.22%). The pesticides used to control the disease blight were Bavistin, Dithane M-45, indofil Z-78 & Bordeaux mixture. Respondents reported that Bavistin (36.84%) and Dithane M-45 (34.21%)were the commonly used chemicals against this blight (phomopsis) disease of brinjal. At the most 40 percent of respondents used blitox to control anthracnose disease of brinjal and other two chemicals were Dithane M-45 (32.50%) and Kavach (27.50%). Majority of respondents (57.58%) applied Kavach pesticide to control leaf spot disease of brinjal. Other two important chemicals they used were Bavistin (33.33%) and Indofil Z-78 (9.09%). The damping off disease causes severe damage in nursery. Only two pesticides mainly used by brinjal growers were the krilaxyl-72 and thirox. Thirox was used by 61.90 percent of respondents whereas Krilaxyl 72 was used by 38.10 percent of respondents to control damping off disease of brinjal crop. Most of the people consider, cultivation is a very easy task. But, in reality, it is a difficult task. In cultivation, there are many aspects where we need sound knowledge & well-developed skill.

Among the various aspects of cultivation, plant protection is most difficult task where proper insect-pests and diseases identification is needed, proper pesticides should be selected, proper dose of pesticides should be used, proper amount of water for spraying is needed, proper time of application is needed, proper method of pesticides application is needed, proper way of spray is needed etc.

Most of the farmers were unable to do these activities systematically and perfectly. Hence, variou short-term training & long term training on various aspects of plant protection should be given to farmers. In this aspect education, plays a significant role. Hence, educated farmers in recent days agriculture is prime need in Indian agriculture.

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