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Research Article

PESTICIDES USE PATTERN OF BETELVINE GROWERS IN CONTROLLING DISEASES IN MIDNAPUR (EAST) DISTRICT OF WEST BENGAL

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ABSTRACT

Betelvine plant is an important and well-familiar plant in Indian agricultural diasporas. After lunch or dinner, chewing a pan quid is a culture of many parts of our country. Hence, the plant is a culture influencing or culture forming plant. Advantages in day to day life and medicinal values have made the plant an essential plant in Indian agriculture. Other dimension of this crop is that it is an important cash crop. It is considered that amongst all cultivated crops, betelvine is the most profitable crop (per unit land production basis). The betelvine cultivation offers perennial employment and income because of its capital and labour intensive characteristics. Keeping it in mind, a study was conducted with the following objective: - to portray the pesticides' use pattern of betelvine growers in controlling diseases was considered. The study was conducted in the state of West Bengal. Multistage random sampling technique was used for selection of the area and respondents. A sample of 100 respondents was randomly selected from the ten selected villages (10 respondents from each selected village) according to convenience. (1) The present study revealed that among the diseases, Foot rot (*Phytophthora parasitica var piperina*) was the most important disease (100%). Least important disease was dew or fog injury (9%), (2) Betelvine growers were using various pesticides to control diseases. (3) The doses of chemicals differed from their recommended does in some cases. (4) For newly introduced chemicals, it is seen that farmers exactly followed recommended dose. (5) Farmers mainly applied the pesticides through spraying method (100%). (6) Majority of respondents' (55%) interval of application of pesticides was 5-7 days (7) Main source of information regarding pesticides use was agricultural input retailers (100%) (8) Farmers were not following the precaution- harvest the crop after knowing the stability of pesticides on that crop as a result residues there on betelvine leaves which will ultimately hamper the health of the consumer. Therefore, the extension agencies who are working at base level should take proper measures to promote the betelvine cultivation, especially, there is needed more awareness programmes on plant protection aspects.

INTRODUCTION

Betelvine (*Piper betle* L.) is a perennial evergreen shade loving creeper to the family piperaceae. In India, it is commercially cultivated as an important and potential cash crop. The betel leaf occupies a significant place in everyday life of Indian people as it is used in rituals and in Indian system of medicine as cure of many diseases and disorders (Das, 2010). Betelvine is cultivated over an area of 50000 ha. in India covering the states of West Bengal, Assam, Meghalaya, Orissa, Andhra Pradesh, Tamil Nadu and Kerala extensively and in other parts of north and south India in sporadic areas. Betelvine cultivation is highly intensive and particularly suited to small holding (may be 5 to 10 decimel land). The edible portion is green leaf, used as masticatory along with arecanut, lime and catechu. Chewing of pan leaf is an ancient habit having existed for more than 2000 years. It is also auspicious to make offering of betel leaf and arecanut on the occasions such as religious ceremonies, pujas and wedding ceremonies. The *pan* leaf contains Vit. B and C and also beneficial in accelerating the process of digestion. It also possesses anti-microbial activity due to peroxidase, nitric and

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secratory antibiotics, which offer protection against microbial proliferation in mouth so that tooth and gum decay is kept under check. The betel leaf is also used as medicinal and cosmetic purposes also (Chandra and Sagar, 2004). Offering betel morsels (pan supari) to guests in the Indian subcontinent is a common courtesy (Palaniappan et al., 2012). The State West Bengal is first among all betelvine producing states of India. Every district of Bengal has more or less betelvine cultivation, but important ones are Midnapur (East), South 24 Paraganas, Howrah, Hooghly and Nadia. Betelvine cultivated area in West Bengal is one-third part of India's total betelvine cultivated area. Betelvine is exported to other countries also. There are many cultivable varieties in our country, but the most important ones are Bangla, Mitha, Sanchi, Daseri, Kapuri etc. (Panda, 2015). Betelvine crop cultivation is a profitable enterprise. Betelvine cultivation is the best example of direct income (in cash) in agriculture. Due to this character, this plant is very loving to farmers (Sengupta & Dutta, 2008). But, all is not well in this enterprise. There are lot of problems in its' cultivation. Out of these, diseases infestation in betelvine crop is one of important problems in its successful cultivation. Keeping it in mind, a study was conducted with the following objective: - to portray the pesticides' use pattern of betelvine growers in controlling diseases was undertaken.

METHODOLOGY

The study was conducted in the state of West Bengal. Multistage random sampling technique was used for selection of the area and respondents. At the first stage of sampling, Midnapur East district, one of leading districts in betelvine production (occupies first position in area of cultivation and production in the state) was purposively selected. Midnapur East district has four sub-division (i.e. Tamluk, Haldia, Contai and Egra), out of these, Tamluk sub-division was selected randomly at the second stage of sampling. The selected sub-division has 7 agricultural blocks (i.e. Tamluk, Shahid Matangini, Panskura-I, Panskura-II, Nandakumar, Chandipur and Moyna), out of these, the Moyna block was selected randomly at the third stage of sampling. The selected block has 85 villages, out of these; ten villages were selected randomly at the last stage of sampling. The selected villages were Sridharpur, Raichak, Gobradan, Bakcha, Payrachak, Kripanandapur, Balvadrachak, Ismalichak, Arangkiyarana and Gojina. Respondents of the study area were betelvine growers of minimum three years experience who having minimum a boraj for betelvine cultivation or are cultivating betelvine for a large area under contract (lease). A sample of 100 respondents was randomly selected from the ten selected villages (10 respondents from each selected village) according to convenience. The number of respondents selected from each village is presented in the following table-1.

Table-I Distribution of respondents (N=100)

Sl.	Name of Village	Number of respondents selected	Percentage of respondents selected
1.	Sridharpur	10	10
2.	Raichak	10	10
3.	Gobradan	10	10
4.	Bakcha	10	10
5.	Payrachak	10	10
6.	Kripanandapur	10	10
7.	Balvadrachak	10	10
8.	Ismalichak	10	10
9.	Arangkiyarana	10	10
10.	Gojina	10	10

RESULTS AND DISCUSSION

Diseases (table-2): - Among the several diseases those attack betelvine yard, the major ones are-(1) Foot rot (100%), (2) Foot rot (17%), (3) Collar rot (90%), (4) Leaf rot (40%), (5) Bacterial Leaf spot (85%), (6) Leaf spot and Anthracnose (80%), (7) Powdery mildew (11%), (8) Dew or fog injury (9%).

Table 2 Commonly infested diseases of betelvine

Sl.	Name of the diseases	Other name	Scientific name of causal organism	NRR	PRR
1.	Foot rot	"Dhale para" or "Chita Bari"	Phytophthora parasitica var piperina	100	100
2.	Foot rot	---	Rhizoctonia solani	17	17
3	Collar rot	Foot rot/ Sclerotial wilt/ Gendi/Madua/Gondi	Sclerotium rolfsii	90	90
4.	Leaf rot	Phoska para or Phopsa	Phytophthora sp.	40	40
5.	Bacterial Leaf spot	Leaf blight/Stem canker/ Kathiya/ Angari/Chitla/Chitra	Xanthomonas campestris var. Betlicola	85	85
6.	Leaf spot and Anthracnose	Angari/Chitla/Chitra	Colletotrichum capsici	80	80
7.	Powdery mildew	---	Oidium piperis	11	11
8.	Dew or fog injury	---	-------	9	9

(NRR=Number of respondents reported; PRR= Percentage of respondents reported)

Foot rot *(Phytophthora parasitica var piperina)* (table-3)**:** - The important symptom is a wet rot condition associated with wilt. Hence this foot rot condition is often described as wilt. The first visible symptom of the disease is the disappearance of luster of the leaves. Soon after, the vines show signs of wilting and the leaves drop and become pale. Finally the vine completely wilts and dries up. The underground parts rot completely. The disease is caused by the fungus, *Phytophthora parasitica* which survives in the soil in the form of dormant oospores. The disease becomes most severe during or just after rainy season. Chakrabarti et al. (2010**)** reported that leaf rot disease (caused by *Phytophthora nicotianae var parasitica f. piperina* Dastur) and foot rot disease (caused by Pythium *piperinum* Dastur.) are two most important diseases of betelvine crop. These are mainly seen in rainy season. For controlling leaf rot disease, application of Bordeaux mixture or suitable copper fungicides are needed whereas controlling foot rot disease treating the ridges with Bordeaux mixture (2:2:50) (125 litres in 50 metre area) before cutting are planted and then at monthly or bimonthly intervals are effective. Common control measures (these measures are occasionally performed by few of farmers generally) **:-** (1) At the time of planting, the cuttings should be dipped at least for 20 minutes in 1 percent Bordeaux mixture or 0.1 percent Ceresan (2) Bordeaux mixture (0.5%) or 0.2 % Zineb (Dithane Z-78) should be spread on the ground near vines and also on diseased leaves at an interval of 15 days from last week of June to October (3) Once the plant is diseased, it should be removed and the soil partially sterilized by drenching with chestnut compound or adding lime and mix thoroughly. Actually, the pest was controlled by applying the following pesticides, their applied doses and percent of respondents followed were given:- Ayalite @1.5ml/litre of water soil application (5%), Takat @1gm/litre of water (44%), Acrobat @1.5ml /litre of water (2%), Roko @1gm/litre of water (4%), Companion @2.0-2.5gm /litre of

water (39%), Blitox 50 WP @4.0 gm/litre of water soil application (27%) and Beam @2.5gm/litre of water (13%).

The fungus is a soil borne pathogen having wide range of host plants.

Table-3 Pesticides applied to control foot rot *(Phytophthora parasitica var piperina)* (N=100)

Name of pesticides	Commercial name	Recommended dose	Applied dose	PRA
Fasetile Aluminium 80%WP	Ayalite	1.5ml/litre of water soil application.	1.5ml/litre of water soil application.	5
Captan 70% + Hexaconazole 5%	Takat	1gm/litre of water	1gm/litre of water	44
Dimithomorph50%WP	Acrobat	1.5ml/litre of water	1.5ml/litre of water	2
Thiophanate Methyl 70% WP	Roko	1gm/litre of water	1gm/litre of water	4
Carbendazim 12% +Mancozeb 63%	Companion	2.0gm/litre of water	2.0-2.5gm/litre of water	39
Copper oxycloride 50% WP	Blitox 50 WP	4.0 gm/litre of water soil application	4.0gm/litre of water	27
Tricyclazole 75% WP	Beam	2.5gm/litre of water	2.5gm/litre of water	13

(PRA= Percentage of respondents applied)

Foot rot *(Rhizoctonia solani)* (table-4)*:*-Typical symptoms develop on the stem base, and older roots as a reddish brown decay of the outer cortical layer developing into a canker which often results in girdling of the stem. The fungus survives in the soil as saprophyte in the form of sclerotia. Initial attack is similar to that caused by *Phytophthora* or *Pythium* showing foot rot. In advance stage of attack the girdling lesion on stem base at or below the soil level becomes discoloured and the rotten portion is distinctly dry unlike that of foot rot. The disease is most prevalent during post monsoon months. Common control measures - (1) Destruction of dead vines (2) Crop rotation (3) Deep summer ploughing (4) Use of organic manures reduce the severity of the disease (5) Clean cultivation and removal of infected plant parts reduces the disease intensity. Actually, the pest was controlled by applying the following pesticides, their applied doses and percent of respondents followed were given:- Blitox 50 WP @4.0 gm/litre of water soil application (4%),Companion @2.0-2.5gm /litre of water (3%), Takat @1gm/litre of water (4%) and Beam @2.5gm/litre of water (7%).

Fig 1 FOOT ROT: *Rhizoctonia solani*

Common control measures-(1) Apply judicious doses of nitrogenous fertilizer (2) Soil sterilization with diluted formalin (1:50) (3) Use *Trichoderma harzianum* @ 2kg/50kg FYM (4) Drenching with *Trichoderma viride* @ 3g/litre of water (5) Bordeaux mixture1% one time in every rainy month-soil application. Actually, the pest was controlled by applying the following pesticides, their applied doses and percent of respondents followed were given:- Captaf @3.0gm /litre of water (40%), Plantvax @1.5gm /litre of water (4%), Contaf @1.5-2.0gm /litre of water (25%), Score @1.0gm /litre of water (3%), Hexatop @1.0gm/litre of water (2%), Flick @2.0 gm/litre of water (7%) Civic @2.5gm/litre of water (5%),Safe @2.0gm/litre of water (23%) and Krilaxyl 72 WP @5.0gm/litre of water (4%).

Fig 2 COLLAR ROT: *Sclerotium rolfsii*

Leaf rot *(Phytophthora sp. and Pythium sp.)* (table-6)*: -* The first symptom of the leaf rot is the appearance of water soaked lesions.

Table 4 Pesticides applied to control foot rot *(Rhizoctonia solani)* of betelvine (N=100)

Name of pesticides	Commercial name	Recommended dose	Applied dose	PRA
Copper oxycloride 50% WP	Blitox 50 WP	4.0 gm/litre of water soil application	4.0 gm/litre of water soil application	4
Carbendazim 12% +Mancozeb 63%	Companion	2.0gm/litre of water	2.0-2.5gm/litre of water	3
Captan 70% + Hexaconazole 5%	Takat	1gm/litre of water	1gm/litre of water	4
Tricyclazole 75% WP	Beam	2.5gm/litre of water	2.5gm/litre of water	7

(PRA= Percentage of respondents applied)

Collar rot (*Sclerotium rolfsii*) (table-5):- The fungus attacks the plants at the collar region and below the soil. Dark lesions start developing from just below the soil to about 10 cm above ground level. The leaves soon turn yellow and fall off resulting in wilting of the entire vines. While ropy mycelial strands creep over the stem portion. Large number of small, light to deep brown sclerotia develops on the mycelial mat.

The infected spots enlarge rapidly to cover the blade, which starts rotting. Diseased leaves turn brown to dark brown and later dirty black. The disease is caused by *Phytophthora parasitica* var. *piperina*, occurs in severe form in rainy season. This is a soil borne pathogen. Two types of foliage rot symptoms are seen.

Table 5 Pesticides applied to control collar rot disease of betelvine (N=100)

Name of pesticides	Commercial name	Recommended dose	Applied dose	PRA
Captan 50% WP	Captaf	2.5gm/litre of water	3.0gm/litre of water	40
Oxycarboxin 20%EC	Plantvax	1.5ml/litre of water	1.5ml/litre of water	4
Hexaconazole 5%EC	Contaf	1.5ml/litre of water	1.5-2.0ml/litre of water	25
Diafenoconazole 25%EC	Score	1.0ml/litre of water	1.0ml/litre of water	3
Thiophanate Methyl 70%WP	Hexatop	1.0gm/litre of water	1.0gm/litre of water	2
Metiram 55% +Pyraclostrabin5% WG	Flick	2.0gm/litre of water	2.0gm/litre of water	7
Tricyclazole 75% WP	Civic	2.5gm/litre of water	2.5gm/litre of water	5
Carbendazim 12% +Mancozeb 63% WP	Safe	2.0gm/litre of water	2.0gm/litre of water	23
Metalaxyl 8%+Mancozeb 64% WP	Krilaxyl 72 WP	5gm/litre of water	5gm/litre of water	4

(PRA= Percentage of respondents applied)

In first type circular, deep brown spots with distinct grey brown zonations are produced on leaves which result in subsequent shedding. In the second type circular dark brown spots are produced but they do not have zonations. The central rotten portion drops off showing holes. Common control measures:- (1) At the time of planting, the setts should be dipped at least for 20 minutes in 1 percent Bordeaux mixture or 0.1 percent Ceresan (2) Bordeaux mixture (0.5%) or 0.2 % Zineb (Dithane Z-78) should be spread on the ground near vines and also on diseased leaves at an interval of 15 days from last week of June to October (3) Soil sterilization with formalin (1:50) (4) Use *Trichoderma harzianum* @ 2kg in 50kg FYM (4) Clean cultivation and removal of infected parts check the disease incidence. Actually, the pest was controlled by applying the following pesticides, their applied doses and percent of respondents followed were given:- Dithane Z 78 @3.0gm /litre of water (11%), Blue copper @2.5-3.0gm /litre of water (22%) and Redomil -Gold @2.0gm/litre of water (4%).

Fig 3 LEAF ROT: *Phytophthora sp*. and *Pythium sp*

Table 6 Pesticides applied to control leaf rot (N=100)

Name of pesticides	Commercial name	Recommended dose	Applied dose	PRA
Zineb 75%W.P.	Dithane Z-78	3gm/litre of water	3.0gm/litre of water	11
Copper Oxychloride 50% W.P.	Blue copper	3gm/litre of water	2.5-3.0gm/litre of water	22
Metalaxyl 4%+Mancozeb 64% WP	Redomil -Gold	2 gm/litre of water	2.0gm/litre of water	4

(PRA= Percentage of respondents applied)

Bacterial Leaf spot (*Xanthomonas campestris var. Betlicola*)(table-7):- It is a bacterial disease caused by *Xanthomonas campestris var. Betlicola.* This is the most serious disease affecting the betelvine yard in Sundarbans. Locally it is known as "Angari". Minute water soaked spots developed on the under surface of leaves. Later these appear on upper surface also as dark round angular ones surrounded by yellowish zone. The centre of spots are mottled down and later turn black and in severe conditions leaves turn yellow and fall. This occurs mainly in high humid season and rapidly covers the whole vine yard. Common control measures: - (1) High precautions are very much necessary to reduce the incidence of this disease in vineyard (2) Two or three sprays of 0.25% Zineb or Zirum should be made after every six months as a protective measure (3)

The disease intensity can also be reduced regulating the shade in the vineyard (4) Drenching with wettable Ceresan 0.1% or Agallol 0.1% (5) This disease can effectively be controlled during primary stage by spraying either of 1 % Bordeaux mixture and Streptomycin sulphate 250-500 ppm or 0.25 - 0.3% Zineb and Streptomycin sulphate 250-500 ppm at monthly interval starting from August to January (6) Uproot the diseased plants and burn or bury them to protect other vines (6) Never use a infected sett for planting in new vineward (6) Spray of Plantomycin 500ppm is also useful in control of leaf spot. Actually, the pest was controlled by applying the following pesticides, their applied doses and percent of respondents followed were given:-Blitox 50 WP @4.0gm /litre of water (56%), Isacide @2.0gm /litre of water (7%), Streptocycline @0.25-.30gm /litre of water (23%), Aureofungin sol @1.0gm/7.5 litre of water (3%). Leaf spot and Anthracnose (*Colletotrichum capsici*) (table-8):- The disease is caused by *Colletotrichum capsici*, a set borne pathogen which is very serious disease. Small black circular lesions appear on leaves expanding rapidly in humid conditions. Leaf spot appears as brownish black centre with yellowish hallow around and in severe cases the leaves drop owing to shrinkage of tissues.

Table 7 Pesticides applied to control Bacterial leaf spot/Leaf blight/Stem canker of betelvine crop (N=100)

Name of pesticides	Commercial name	Recommended dose	Applied dose	PRA
Copper oxycloride 50% WP	Blitox 50 WP	4.0 gm/litre of water	4.0gm/litre of water	56
Copper hydroxide 77% WP	Isacide	2.0 gm/litre of water	2.0gm/litre of water	7
Streptomycin sulphate +Tetra cycline Hydrochloride (9:1 ratio)	Streptocycline	0.25 gm/litre of water	0.25-.30gm/litre of water	23
Aureofungin 46.15 % SP	Aureofungin sol	1.0gm/7.5 litre of water	1.0gm/litre of water	3

(PRA= Percentage of respondents applied)

Fig 4 Bacterial Leaf Spot *Xanthomonas campestris* pv. *Betlicola*

Common control measures:- (1) Use healthy planting materials (2) Improved drainage system is the prime requirement to reduce the severity of the disease (3) Before planting the setts should be dipped in 0.1% Ceresan or other organo mercurial solutions (4) Cutting to be used for planting purpose should also be treated with 1% Bordeaux mixture (5) Spraying once or twice 0.2% solution of Zineb (Dithane Z-78) or 0.1% Bavistin (7) In severe case drench the soil with Metalaxyl 8% W.P. +Mancozeb 64% WP @ 2g/ litre of water. Actually, the pest was controlled by applying the following pesticides, their applied doses and percent of respondents followed were given:- Kabach @2.0gm /litre of water (17%), Dithane M-45@2.0-3.0gm /litre of water (22%), Phytolan @2.0-2.5gm /litre of water (9%), Coside-101 @1.5gm /litre of water (5%), Sitara @1.5ml /litre of water (2%), Clunch @2.0 gm/litre of water (2%) Plantvax @1.5ml /litre of water (3%), Index @1.0gm/litre of water (7%), Melody @1.0gm/litre of water (4%),. Derosal @1.0 gm/litre of water (25%), Beam @2.5gm/litre of water (14%) and Mirador @1.0ml/litre of water (5%).

Table 8 Pesticides applied to control leaf spot and anthracnose of betelvine crop (N=100)

Name of pesticides	Commercial name	Recommended dose	Applied dose	PRA
Chlorothalonil 75%WP	Kabach	2.0gm/litre of water	2.0gm/litre of water	17
Mancozeb 75% WP	Dithane M-45	2.0-2.5gm/litre of water	2.0-3.0gm/litre of water	22
Copper Oxychloride 50% WP	Phytolan	2.0-2.5gm/litre of water	2.0-2.5gm/litre of water	9
Copper hydroxide 77% WP	Coside-101	1.5 gm/litre of water	1.5gm/litre of water	5
Hexaconazole 5%EC	Sitara	1.5 ml/litre of water	1.5ml/litre of water	2
Metiram55% +Pyraclostrabin5%	Clunch	2.0gm/litre of water	2.0gm/litre of water	2
Oxycarboxin 20% EC	Plantvax	1.5 ml/litre of water	1.5ml/litre of water	3
Myclobutyanil 10% WP	Index	0.5gm/litre of water	1.0gm/litre of water	7
Iprovalicarb 5.5% WP	Melody	1 gm/litre of water	1 gm/litre of water	4
Carbendazim 50% WP	Derosal	1gm/litre of water	1gm/litre of water	25
Tricyclazole 75% WP	Beam	2.5gm/litre of water	2.5gm/litre of water	14
Azoxystrobin 23%SC	Mirador	1ml /litre of water	1ml /litre of water	5

(PRA= Percentage of respondents applied)

Powdery mildew (*Oidium piperis*) (table-9):- The disease affects the foliage, causing several damages. Small white patches appear on both the surfaces of young leaves. These patches enlarge running together to cover large portion of the blade, covering the leaf surface with characteristic whitish powdery coating. It is a fungal disease. The fungus survives on the old vines. It is an air borne disease usually appears in the month of January and February. Warm humid weather and cool nights favours the spread of disease. The early symptom is the production of grey spots with a dull green halo, which enlarges in size under favourable conditions. The spots coalesce and cover both surfaces of leaves with powdery masses. Infected leaves turn reddish and drop easily. The fungus survives on the old vines. Actually, the pest was controlled by applying the following pesticides, their applied doses and percent of respondents followed were given:- Sultaf @2.0-4.0gm/litre of water (7%) and Bavistin @1.0gm /litre of water (10%).

Table 9 Pesticides applied to control powdery mildew of betelvine crop (N=100)

Name of pesticides	Commercial name	Recommended dose	Applied dose	PRA
Sulphur 80%WP	Sultaf	3gm/litre of water	2.0-4.0gm/litre of water	7
Carbendazim 50% WP	Bavistin	1gm/litre of water	1gm/litre of water	10

(PRA= Percentage of respondents applied)

Dew or fog injury (table-10):-Betelvine leaves are also damaged due to dew or fog injury. In winter season the leaves are injured due to drops of dew which turns into white spots and blotch. This injury can reduce the market price of infected betel leaves. Sometimes these types of leaves are not sold in market. This is mainly one kind of physiological disorder and no organism is responsible for it. Later stages these spots become brown or black in colour. This types of spots are not seen in other parts of plant body except leaves. Shedding of leaves happen when too many spot created on leaves, but plant does not die. Common control measures: - (1) The disease can effectively be controlled by spraying 0.3% Zineb (Dithane-Z-78) or 0.25 to 0.3% Zirum spray 2-3 times on a fortnightly interval (2) The disease incidence can also be lowered through extra layering of upper surface of boroj by paddy straw. Actually, the injury was controlled by applying the following pesticides, their applied doses and percent of respondents followed were given:- Dithane-Z-78@3.0gm /litre of water (9%) and Cuman-L @2.5ml /litre of water (7%).

Table 10 Pesticides applied to control dew or fog injury of betelvine (N=100)

Name of pesticides	Commercial name	Recommended dose	Applied dose	PRA
Zineb-75% WP	Dithane-Z-78	2.5gm/litre of water	3.0gm/litre of water	9
Zirum 27% SL	Cuman-L	2.5ml/litre of water	2.5ml/litre of water	7

(PRA= Percentage of respondents applied)

Interval of applying pesticides and method of application of pesticides (table-11):-

Interval of application of pesticides:-At the most 55 percent of respondents applied chemicals at the interval of 5-7 days

whereas at the lowest 10 percent of respondents applied chemicals 2-4 days interval. Another interval of days of application was 8-15 days (22%) and above 15 days (13%).

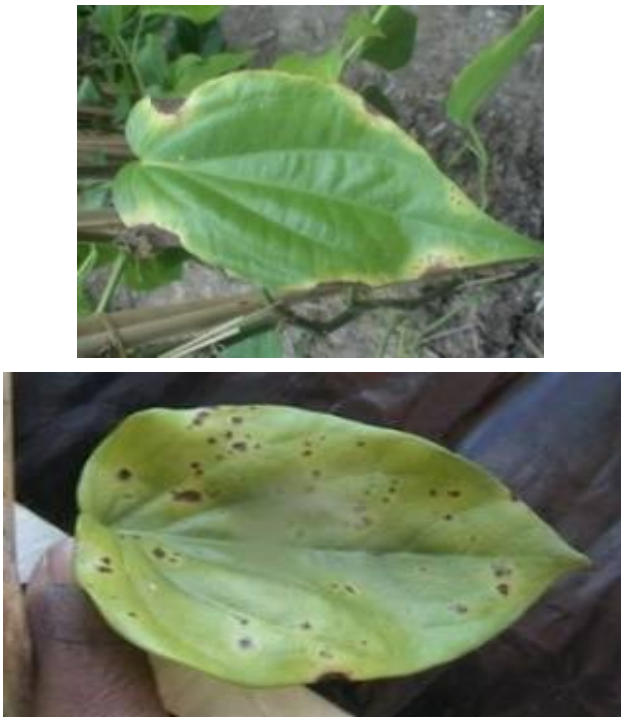

Fig 5 Leaf Spot And Stem Anthracnose: *Colletotrichum capsici*

Methods of application of pesticides:-Surprisingly, all the respondents (100%) in the study area applied pesticides through spraying method. Only 9 percent of respondents applied pesticides through dibbling method, but nobody used chemicals through dusting method.

Table 11 Interval of application and method of application of pesticides (N=100)

Days of interval	Number of respondents followed	Percentage of respondents followed	Methods of application of pesticides	Number of respondents followed	Percentage of respondents followed
2-4	10	10	Spraying	100	100
5-7	55	55	Dibbling	9	9
8-15	22	22	Dusting	0	0
Above 15 days	13	13			

Source of information regarding use of pesticides (table-12):- All the respondents (100%) collected information regarding use of pesticides from agricultural input retailers whereas at the lowest 8 percent of respondents gathered information from relatives who cultivate the betelvine crop. Nearly half of respondents (46%) collected from big farmers, 37 percent of respondents collected from fellow farmers, 13 percent of farmers collected it from neighbours and 12 percent of respondents also collected from other sources. Singh et al. (2014) reported that about one-third of the respondents (33.75%) and nearly one-fourth of the respondents (23.75%) had medium and high overall information seeking behaviour respectively. Private dealers, friends, kisanmela and PAU scientists were emerged as the main sources of seeking information. The weed control, plant protection, recommended varieties and fertilizer applications were the major areas for seeking information regarding vegetable cultivation. Most of the respondents shared information with neighbours, friends, relatives and mode of sharing was verbal as stated by 100 percent of the respondents.

Table 12 Source of information regarding use of pesticides on betelvine crop (N=100)

Source	Number of respondents collected information	Percentage of respondents collected information
Retailers	100	100
Big farmers	46	46
Fellow farmers	37	37
Neighbours	13	13
Relatives	8	8
Others	12	12

Important considerations: - (1) There is no recommendation of application of granular pesticides in already established boroj. Granular pesticides must be used before establishment of boroj. (2) Preventive measures are always good compare to control measures.(3) Only few recommended pesticides are there to apply on betelvine crop but farmers used many chemicals to control insect-pests and diseases of betelvine crop due to their lack of knowledge. (4) Red sign labeled chemicals must not be used for controlling insect-pests and diseases. (5) Betelvine leaves are consumed raw, therefore, too much application of poisonous chemicals is strictly prohibited. (6) After application of chemicals 15-20 days are to be waited to harvest leaves (7) At the most 90 percent of respondents reported that in betelvine crop insect-pests infestation is less, but diseases are the main problem.(8) There is lack of sufficient research on betelvine crop cultivation (9) Business minded attitude of betelvine growers preventing them to follow precautions properly.

CONCLUSION

The present study revealed that among the diseases, foot rot disease *(Phytophthora parasitica var piperina)* was the most important/harmful disease (100%). Least important disease was dew or fog injury (9%). (2) Betelvine growers were using various pesticides to control diseases. (3) The doses of chemicals differed from their recommended does in some cases. (4) For newly introduced chemicals, it is seen that farmers exactly followed recommended dose. (5) Farmers mainly applied the pesticides through spraying method (100%). (6) Majority of respondents' (55%) interval of application of pesticides was 5-7 days (7) Main source of information regarding pesticides use was agricultural input retailers (100%) (8) Farmers were not following the precaution- "harvest the crop after knowing the stability of pesticides on that crop"- as a result there are residues on betelvine leaves which will ultimately hamper the health of the consumer. As a result few of countries where export is done those are rejecting Indian produces due to presence of residues in agricultural products. Unique character of betelvine cultivation is that it is highly suited to small holding may be 5-10 decimal land. Therefore, it is the need of the hour to sustain cultivation of such type of highly potential crop. There are several limitations of betelvine cultivation according to respondents, out of these the most important ones are mainly (1) Diseases infestation and insect-pests infestation (2) Lack of proper price of product (3) No insurance in betelvine cultivation (4) Lack of irrigation water (5) Lack of soil testing facility (6) Price of input is high (7) Lack of fund (8) Lack of proper export (9) Cultivation cost is

more (10) Flood problem (11) Problem of high wind blowing (12) Lack of proper marketing system (13) Lack of space for cultivation (14) Unavailability of labour (15) Labour charge is more (16) Traditional bound attitude of farmers to grow traditional crops etc. Out of these problems, diseases and insect-pests infestation is major one. If this problem is managed properly automatically farmers will have better profit margin. Only in few states, Assam Meghalaya, West Bengal, Orissa, Andhra Pradesh, Tamil Nadu and Kerala, betelvine cultivation covers vast areas but in other states especially in Northern India, it is cultivated in few pockets. Therefore, sufficient information is unavailable for proper controlling of insect-pests and diseases. To solve these problems we need the following prime considerations-(1) More research will be conducted on plant protection aspects of betelvine cultivation at university levels as well as govt. levels considering a potential crop in Indian agriculture. (2) Govt. should consider betelvine cultivation as important crop cultivation (3) Govt. should take various promotional measures to expand the betelvine cultivation area horizon in our country. (4) Govt. should take proper and confirm measures to export the betelvine products to other countries. (5) On aspect of value addition of betelvine products, more researches are to be conducted. (6) To enhance the export, farmers are to be motivated to cultivate the crop organically. (7) More short term training on plant protection aspects are to be conducted. Therefore, the extension agencies who are working at base level should take proper measures to promote the betelvine cultivation, especially, there is needed more awareness programmes on plant protection aspects. Farmers are traditional in nature due to their low educational level or no education level and try to cultivate few crops traditionally, these awareness programmes will focus on economic aspects of crop cultivation and automatically they will be motivated to cultivate more profit providing crops. Betelvine crop is such type of profit making crop. The crop must be cultivated organically or following IPM (Integrated Pest Management) practices/IDM (Integrated Diseases Management) practices so sustainability of crop production will be maintained as well as sustainability of market demand will prevail.

"If conservation of natural resources is gone wrong, no else other will go right."

- Dr M. S.Swaminathan

References

Chakrabarti et, D.K.; Kumar, S. and Chand, G. (2010) A Guidebook for Diseases of Horticultural Crops; Narendra Publishing House, Delhi, P-88-89.

Chandra, G. & Sagar, R. L. (2004) Harvesting Green Gold: Cultivation of betelvine in Sundarban: *Indian Farmers' Digest*: 37 (3): 5-13.

Das, B.K. (2010) Incidence of *Aleurocanthus spp.* on betelvine and their interaction with host plants. *The Journal of Plant Protection Sciences*: 2 (2): 53-59.

Palaniappan, G.: Sengottiyan, A. and Saravanan, T. (2012) Betel leaf: The green gold of India; *Market survey report*, P: 21-24.

Panda, J. (2015) *Paschimbange Arthakari Paner Chash*: Devi Book Publisher; Hooghly, P-9

Sengupta, K. and Dutta, P. (2008) *Pan, Supari o Narkeler Chash*: Mehanati Prakashani, Hooghly, P-11, 38-47.

Singh, J. , Kalra, R.K., Sharma, A. and Sanatombi, K.H. (2014):-Information seeking and information sharing behaviour of the vegetable growers of Ludhiana district; *Agriculture Update*: 9(3): 377-382.

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