INFESTATION SUPPRESSION UNDER EVALUATION OF ECOFRIENDLY INSECTICIDES AGAINST MAJOR INSECT PESTS OF RICE IN EASTERN UTTAR PRADESH CONDITIONS

ABSTRACT

The present study was undertaken to analysis thesuppression of infestation over check plot under evaluation of ecofriendly insecticidesagainst major insect pests of rice in Eastern Uttar Pradesh conditions for the two consecutive years (2014 and 2015) at farmer field of district Deoria, India.This evaluation was observed most effective ecofriendly insecticides concerned to lowest infestation, highest suppression of infestation over check plot, and highest yield.The inferences of suppression over check plot and yield of rice crop were based on non-significant ecofriendly insecticides for lowest infestation.There were 2 insecticides (Cartap Hcland Imidacloprid) inference non-significant for highest suppression of infestation over check. There were 3 insecticides (Cartap Hcl, Imidacloprid, and Neem Oil + Btk) inference non-significant for lowest infestation and highest yield respectively. The mean ranking and inference of suppression over check were similar to inference of non-significant ecofriendly insecticides for lowest infestation as, Imidacloprid, Cartap Hcl, and Neem Oil + Btk respectively.There were 10 treatments (09 insecticides + 01 check) evaluated under randomized block design (RBD) by transplanting method of rice cultivation on localized popular rice cultivar Samba Mahsuri.The insecticide treatments comprise 9 insecticides (Cartap Hcl, 50 SP, Indoxacarb 14.5 SC, Imidacloprid 17.8 SL, Chlorpyriphos 20 EC, Thiamethoxam 25 WG, Chlorantraniliprole 18.5 SC, Azadirachtin (Neem Oil) 0.03 EC, *Bacillus thuringiensis kurstaki*(Btk) 3.5 WP, and combination of Neem Oil 0.03 EC + Btk 3.5 WP).The infestations of major insect pests of rice were observed for most serious insect pests, which were 1.Yellow stemborer (*Scirpophagaincertulus* Walker), 2.Common rice leaffolder (*Cnaphalocrosismedinalis*Guenee), 3.Brown planthopper (*Nilaparvatalugens*Stal), 4.Rice hispa (*Dicladispaarmigera* Oliver), and 5.Rice earhead bug (*Leptocorisaacuta* Thunberg).

Key words: Infestation suppression, Ecofriendly insecticides, Major Insect Pests of rice, Eastern Uttar Pradesh, India.

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Comment [U5]: Improved Samba Mahsuri (RP Bio-226) is a high yielding fine grain rice variety. In a collaborative project, scientists from CSIR-CCMB and the ICAR-Indian Institute of Rice Research[1] (IIRR, erstwhile Directorate of Rice Research [DRR]), worked together to develop it.

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Comment [U8]: SAMPLE ABSTRACT: Aims:Hereclearlywrite the aims of thisstudy. Sample: To correlate plateletcount, splenic index (SI), plateletcount/spleendiameterratio and portal-systemicvenouscollateralswith the presence of esophagealvarices in advancedliverdiseasetovalidateotherscreeningparameters. Study design: Mention the design of the studyhere. Place and Duration of Study: Sample: Department of Medicine (Medical Unit IV) and Department of Radiology, Services Institute of Medical Sciences (SIMS), Services Hospital Lahore, betweenJune 2009 and July 2010. Methodology:Pleasewritemain points of the researchmethodologyapplied. Sample: Weincluded 63 patients (40 men, 23 women; age range 18-75 years) withlivercirrhosis and portal hypertension, withorwithout the medical history of gastrointestinal bleeding. Clinical as well as hematologicalexamination (plateletcount) and ultrasonography (gray as well as color Doppler scaleincludingsplenic index and splenorenal/ pancreaticoduodenalcollaterals) wasdonebesidesupper GI endoscopy for esophagealvarices. Plateletcount/spleendiameterratiowasalsocalculated. Results:Kindly make sureto include relevantstatisticshere, such as sample sizes, response rates, P-valuesorConfidenceIntervals. Do notjustsay "thereweredifferencesbetween the groups". sample: Out of 63 patients, 36 patientswithsmallvarices (F1/F2) and 27 withlarger (F3) varicesweredetectedonendoscope. ... [1]

INTRODUCTION

Rice (*Oryza sativa* Linn.) is one of the most important staple foods of the world as well as India.[X]The rice fragrance spreads to the entire world. It provides livelihood and food security to the about, 56% of the world population (7.46 billion) as well as 65% of the India population (1.32 billion). [X]India shares 21 % of the world rice production and occupies second position after China.[X] Uttar Pradesh shares 15 % of the India rice production occupies second position followed by West Bengal (17%) and first in rice production area.[X]Despite these above proud credentials, Uttar Pradesh is not appearing leading position.The main cause of low productivity of rice is ill cultivation practices and crop losses. The crop losses share about 32.1% losses by plant ailments and among them, about 10.8% losses caused by pests globally and India have been reported about 17.5% losses caused by insect pests.[X] Historically, insect pest outbreaks have been causing extensive losses in rice crop production ranging from 60 to 95 % over world. India have been estimated rice crop losses by insect pests ranging from 21 to 51 %.About 800 insect pest species associated with rice crop over world. [X]Among them about 250 insect pest species associated with rice crop in India and about 20 of them are major economic significance. Out of 20 major insect pests of rice, 12 of national significance and 08 of regional significance have been recognized respectively. The insect pests of rice infest all parts of the plant at all growth stages and transmit few viral diseases of rice.[X](Pathak and Khan, 1994; Oerke, 2006; Dhaliwal *et al*., 2015; Heinrichs and Muniappan, 2017; Sharma *et al*., 2017;DAC&FW, 2018; Pathak *et al*., 2018; FAOSTAT, 2021).

Insect pest management is the continuous process varied among complex ecosystem of nature. The regular efforts are necessary to develop effective strategy for insect pest management with particular agroecosystem under changing climatic conditions.[X]Though, Farmers are practicing all possible available methods and techniques for rice insect pest management, but all the management practices are concentrated to the farmers' perception about finishing approach of insect pests ignoring the significant role of bioagents in suppression of infestation rice insect pests.[X]No doubt, Insecticides are the most powerful tool available for use in pest management and continue to be the foreseeable future.Insecticides are most common pesticides used widely in crop production.[X]The role of pesticides in crop production to augment output has been well perceived and these have been considered essential inputs in crop production.[X]There have been bunch of insecticides including conventionaland novel chemical insecticides, and biological insecticidestrending

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commonly in scientific community to evaluate their efficacy regarding ecofriendly approach, while combination application of biological insecticides have been limited evaluation towards biorationalapproach ofpest management.[X]Therefore, this research work selected those novel insecticides and their combinations to evaluate their efficacy regarding the ecofriendly approach, which has been commonly trending among the scientific community and as well as market availability among Eastern Uttar Pradesh conditions.[X]

Chakraborty (2011)[X]and Chakraborty and Deb (2011)[XX] both have been reported that, the efficacy of Imidacloprid was observed lower the infestation of yellow stemborer (*Scirpophagaincertulus*) and common rice leaffolder (*Cnaphalocrocismedinalis*). Kulagod*et al.* (2011)[XXX].studied on evaluation of efficacy of biorationalsas Azadirachtin and *Bacillus thuringiensis* formulation against yellow stemborer (*Scirpophagaincertulus*) and common rice leaffolder (*Cnaphalocrocismedinalis*)of rice was observedlower the infestation.Rath *et al.* (2014)[XXXX]has beenobserved that,the lowest infestation of yellow stemborer (*Scirpophagaincertulus*)and rice earhead bug(*Leptocorisaacuta*) were recorded in Imidacloprid,and highest grain yieldwas recorded inThiamethoxam treated plots.Sarao*et al.* (2015)[C]andTigga*et al.* (2018)[V]both have beenfound that, the damage of yellow stemborer(*Scirpophagaincertulus*) andrice earhead bug(*Leptocorisaacuta*) were recorded lowest in Imidacloprid.

MATERIALS AND METHODS

The present study was undertaken to analysis the suppression of infestation over check plot under evaluation of ecofriendly insecticides against major insect pests of rice in Eastern Uttar Pradesh conditions for the two consecutive years (2014 and 2015) at farmer field of district Deoria, India.Thisconfined spot of study,represents theconductive environment for survival and proliferation of insect pests in rice ecosystem under Eastern Uttar Pradesh conditions. There were 10 treatments (09 insecticides + 01 check) evaluated under randomized block design (RBD) by transplanting method of rice cultivation on localized popular rice cultivar 'Samba Mahsuri'.The insecticide treatments comprise 9 insecticides (Cartap Hcl, 50 SP, Indoxacarb 14.5 SC, Imidacloprid 17.8 SL, Chlorpyriphos 20 EC, Thiamethoxam 25 WG, Chlorantraniliprole 18.5 SC, Azadirachtin (Neem Oil) 0.03 EC, *Bacillus thuringiensis kurstaki*(Btk) 3.5 WP, and combination of Neem Oil 0.03 EC + Btk 3.5 WP).The Spray formulations¿¿¿selected as recommended for lowland rice ecosystems to avoid leaching and toxicity to beneficial soil inhabitantsof granular formulations despite effectivity. Application of insecticides spraying were taken for two times at 30 days and 45 days after transplanting

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EX. Chakraborty (2011) [X]

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Material and methods
Giveadequateinformationtoallow the experimenttobereproduced. Alreadypublishedmethodsshouldbementionedwithreferences. Significantmodifications of publishedmethods and new methodsshouldbedescribed in detail. Thissectionwill include sub-sections. Tables& figures shouldbeplacedinside the text. Tables and figures shouldbepresented as per theirappearance in the text. It issuggestedthat the discussionabout the tables and figures shouldappear in the textbefore the appearance of the respectivetables and figures.No tablesor figures shouldbegivenwithoutdiscussionorreferenceinside the text. Tablesshouldbeexplanatoryenoughtobeunderstandablewithoutanytextreference. Double spacingshouldbemaintainedthroughout the table, includingtableheadings and footnotes. Tableheadingsshouldbeplacedabove the table. Footnotesshouldbeplacedbelow the tablewithsuperscriptlowercaseletters. ... [2]

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(30 DAT and 45 DAT). Samples were taken 03 times at 03, 07 and 14 days after spraying per spray of insecticides and single sample before first spray of insecticides respectively. The duration of rice crops started from pre week of August to mid-week of November for about 110 days. There were 5 samples collected per plot at the size of 20 m^2. Each plot was selected 5 spots (4 in the corner and one in the center) at 01 hill/spot to observe infestation, and also at each plot, 05 net sweeps were made randomly at every 05 steps to observe abundance of insect pest species. The spraying of insecticides was made by manually operated knapsack sprayer with hollow cone nozzle @ 500 l/ha spray volume. The timing of sampling was 9.30 A.M. to 12.30 P.M. and timing of spraying was 2.30 P.M. to 4.30 P.M. respectively. Each observation was recorded % infestation of major insect pestsand yield of rice crop to evaluate efficacy of treated ecofriendly insecticides.This observation was analyzed the suppression ofinfestation over check plotof major insect pests of rice during evaluation most effective ecofriendly insecticides concerned to lowest infestationand highest yield respectively.

Surveillance was conducted as per methodology of agroecosystem analysis (AESA)(Pontius *et al.*, 2002)[N]modified as accessibility. Taxonomic identification was verified with texts of reference, *i.e.*, Dale (1994)[M], Barrion and Litsinger (1994)[L], Pathak and Khan (1994)[K], David and Ananthakrishnan (2004)[J]; Rice knowledge management portal (RKMP); and Subject experts respectively.The statistical inferences were verified with texts of reference, *i.e.*, Dhamu&Ramamoorthy (2007)[H], and Rangaswamy (2010)[F]. The formula of suppression of infestation over check was adopted as follows,

Suppression of infestation over check (%) = (% of Infestation in treated plot over thecheck plot - 100)

$$\text{Infestation of insect pest in treated plot} \\ \text{\% of Infestation in treated plot over the check plot} = \frac{}{\text{Infestation of insect pest in check plot}} \times 100$$

RESULTS AND DISCUSSION

Thesuppression of infestation over check plot was observed under evaluation of efficacy of some novel ecofriendly insecticides oninfestation of major insect pests of rice for the two consecutive years 2014 and 2015 respectively.The infestations of major insect pests of rice were observed for most serious insect pests, which were 1.Yellow stemborer (*Scirpophagaincertulus*Walker), 2.Common rice leaffolder(*Cnaphalocrosismedinalis*Guenée), 3.Brown planthopper (*Nilaparvatalugens*Stal), 4.Rice hispa (*Dicladispaarmigera* Oliver), and 5.Rice earhead bug (*Leptocorisaacuta*

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Thunberg).Of the total observed evaluation of ecofriendly insecticideson infestation of major insect pests of rice for pooled of both the years 2014 and 2015 wereinference non-significant for highest suppression over check (SPOC) as, 3 insecticides (Cartap Hcl,Imidacloprid, and Neem Oil + Btk) forYellow stemborer (*Scirpophagaincertulus* Walker), Common rice leaffolder (*Cnaphalocrosismedinalis*Guenee), and Brown planthopper (*Nilaparvatalugens*Stal); 1 insecticide (Imidacloprid) for Rice hispa (*Dicladispaarmigera* Oliver); and2 insecticides (Imidacloprid and Chlorpyriphos) for Rice earhead bug (*Leptocorisaacuta* Thunberg) respectively. (Table and Figure 1).

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Of the total observed evaluation of ecofriendly insecticides against major insect pests of riceunder suppression over check (SPOC) for pooled of both the years 2014 and 2015, there were 3 insecticides (Cartap Hcl, Imidacloprid, and Neem Oil + Btk) inference non-significant for highest suppression over check (SPOC) under first application (30 DAT) and second application (45 DAT), based on evaluation of non-significant ecofriendly insecticides for lowest infestation as, Cartap Hcl, Imidacloprid, and Neem Oil + Btk respectively. The mean of evaluation under suppression over check was observed as, 2 insecticides (Cartap Hcl and Imidacloprid) inference non-significant for highest suppression over check under mean of first application and second application, based on mean evaluation of non-significant ecofriendly insecticides for lowest infestation as, Cartap Hcl, Imidacloprid, and Neem Oil + Btk respectively. Of the total observed infestation of major insect pests of rice for pooled of both the years 2014 and 2015, there were 3 insecticides (Cartap Hcl, Imidacloprid, and Neem Oil + Btk) inference non-significant for lowest infestation under first application (30 DAT); and 4 insecticides (Cartap Hcl, Imidacloprid, Chlorantraniliprole, and Neem Oil + Btk) inference non-significant for lowest infestation under second application (45 DAT) respectively.The mean of evaluation was observed as, 3 insecticides (Cartap Hcl, Imidacloprid, and Neem Oil + Btk) inference non-significant for lowest infestation under mean of major insect pests of rice and mean of first application and second application; and along with 3 insecticides (Cartap Hcl, Imidacloprid, and Neem Oil + Btk) were also inference non-significant for highest yield respectively.Of the most effectiveecofriendly insecticidesobserved on infestation of major insect pestsof rice for pooled of both the years 2014 and 2015,there were 2 insecticides (Cartap Hcl and Imidacloprid) inference non-significant for highest suppression over check (SPOC);3 insecticides (Cartap Hcl,Imidacloprid, and Neem Oil + Btk) inference non-significant for lowest infestation; and 3

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insecticides (Cartap Hcl,Imidacloprid, and Neem Oil + Btk) inference non-significant for highest yield for mean of major insect pests of rice respectively. (Table X andFigure 2).

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The ranking of evaluation undersuppression over check was observed as, Imidacloprid >Cartap Hcl> Neem Oil + Btk>Chlorantraniliprole> Indoxacarb > Chlorpyriphos > Thiamethoxam > Neem Oil >Btkfor highest suppression over check;Imidacloprid >Cartap Hcl> Neem Oil + Btk>Chlorantraniliprole> Indoxacarb > Chlorpyriphos > Thiamethoxam > Neem Oil >Btkfor lowest infestation;Cartap Hcl> Imidacloprid > Neem Oil + Btk>Chlorantraniliprole> Indoxacarb > Chlorpyriphos > Neem Oil > Thiamethoxam >Btkfor highest yield;and Imidacloprid >Cartap Hcl> Neem Oil + Btk>Chlorantraniliprole> Indoxacarb> Chlorpyriphos > Thiamethoxam > Neem Oil >Btkfor mean of infestation, suppression over check (SPOC), and yield respectively.(Table 3).Similar findings were reported byChakraborty (2011)[X],Chakraborty and Deb (2011)[XX], Kulagod*et al.* (2011)[E] , CRRI (2014)[R],Rath*et al.* (2014)[Y]Sarao*et al.* (2015)[U], and Tigga*et al.* (2018)[I].

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Present research work was adopted the non-significant lowest infestation for observation ofhighest suppression of infestation over check plot as scale to confined efficacy of insecticides as ecofriendly. There were 3 insecticides (Cartap Hcl, Imidacloprid, and Neem Oil + Btk) inference non-significant for lowest infestation and highest yield respectively.Though, Cartap Hcl was being most effective insecticides for major insect pests of rice among 3 insecticides (Cartap Hcl,>Imidacloprid>Neem Oil + Btk) as inference non-significantly for highestyield, butthis observation was changed in highestsuppression of infestation over check plot most effectivelyas,Imidacloprid>Cartap Hcl>Neem Oil + Btk respectively. The mean ranking and inference of suppression over check were similar to inference of non-significant ecofriendly insecticides for lowest infestation as, Imidacloprid>Cartap Hcl>Neem Oil + Btk respectively. Though, all these 3 insecticides were being most effective ecofriendly insecticides as, the Imidacloprid and Cartap Hcl arethe chemical insecticides, while Neem Oil + Btkare the biological insecticides (biorationals). Hence, Neem Oil + Btk as biorationals primarily would be the best choice before Imidaclopridand Cartap Hcl for the ecofriendly management of major insect pests of

rice.Similar recommendation has also been reported by Schoenly*et al*. (1996)[D], Heong*et al*. (1998)[O], Gallagher *et al.* (2002)[P], Norton *et al.* (2010)[Z], Prakash *et al.* (2014)[X], Heinrichs and Muniappan (2017)[CC] and Rao (2019)[VV

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Table1. Mean Evaluation of Ecofriendly Insecticides for Major Insect Pests (Pooled of 2014 & 15)* (% Infestation (Infestation) and % Suppression of Infestation over Check (SPOC))

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Treatments	Yellow Stemborer	Common Rice Leaffolder	Brown Planthopper	Rice Hispa	Rice Earheadbug	Total Mean SPOC DAAp	Total Mean Infestation DAAp
	SPOC	SPOC	SPOC	SPOC	SPOC		
1.Cartap Hcl	61.85 $^{1\ NS}$ (7.87)	53.19 $^{1\ NS}$ (7.28)	40.04 $^{2\ NS}$ (6.36)	49.59 (7.05)	69.62 (8.32)	54.86 $^{2\ NS}$ (7.38)	3.39 $^{2\ NS}$ (1.91)
2.Indoxacarb	50.63 (7.10)	39.27 (6.23)	26.87 (5.20)	37.39 (6.12)	69.02 (8.29)	44.64 (6.59)	4.16 (2.09)
3.Imidacloprid	59.45 $^{2\ NS}$ (7.73)	48.97 $^{3\ NS}$ (7.00)	41.81 $^{1\ NS}$ (6.50)	50.83 $^{1\ NS}$ (7.14)	75.95 $^{2\ NS}$ (8.71)	55.41 $^{1\ NS}$ (7.44)	3.38 $^{1\ NS}$ (1.90)
4.Chlorpyriphos	43.15 (6.55)	25.32 (5.03)	28.94 (5.42)	34.98 (5.93)	83.91 $^{1\ NS}$ (9.18)	42.71 (6.38)	4.39 (2.12)
5.Thiamethoxam	46.51 (6.78)	33.75 (5.79)	26.74 (5.21)	33.58 (5.80)	66.18 (8.11)	41.43 (6.35)	4.41 (2.14)
6.Chlorantraniliprole	52.01 (7.22)	38.99 (6.24)	33.57 (5.83)	41.93 (6.48)	63.41 (7.92)	46.72 (6.74)	4.03 (2.06)
7.Neem Oil	41.08 (6.39)	28.78 (5.36)	29.61 (5.48)	38.07 (6.17)	54.21 (7.30)	38.91 (6.18)	4.52 (2.18)
8.Btk	48.65 (6.96)	36.09 (6.00)	23.85 (4.92)	31.16 (5.58)	41.57 (6.39)	36.47 (5.99)	4.65 (2.21)
9.Neem Oil + Btk	58.97 $^{3\ NS}$ (7.69)	50.63 $^{2\ NS}$ (7.10)	38.21 $^{3\ NS}$ (6.22)	46.66 (6.83)	55.36 (7.38)	49.97 (7.04)	3.68 $^{3\ NS}$ (1.98)
10.Untreated Check	–	–	–	–	–	–	7.27 (2.73)
$SE_{(m)}$	0.15	0.15	0.14	0.02	0.20	0.04	0.03
$CD_{(5\%)}$	0.45	0.46	0.41	0.05	0.59	0.11	0.08
$CV_{(\%)}$	2.96	3.47	3.40	0.38	3.50	0.78	1.90

* Values in parentheses are square root transformation (√ (x + 0.5)) for uniform sample size (Steel and Torrie, 1960); 1,2,3 numerals are rank orders and NS stands for non-significant respectively; Comparison of all data respective to the non-significant lowest insect pest infestation.

Figure1. Mean 1 Evaluation of Ecofriendly Insecticides for Major Insect Pests (Pooled of 2014 &15). (% Infestation (Infestation) and % Suppression of infestation over Check (SPOC))

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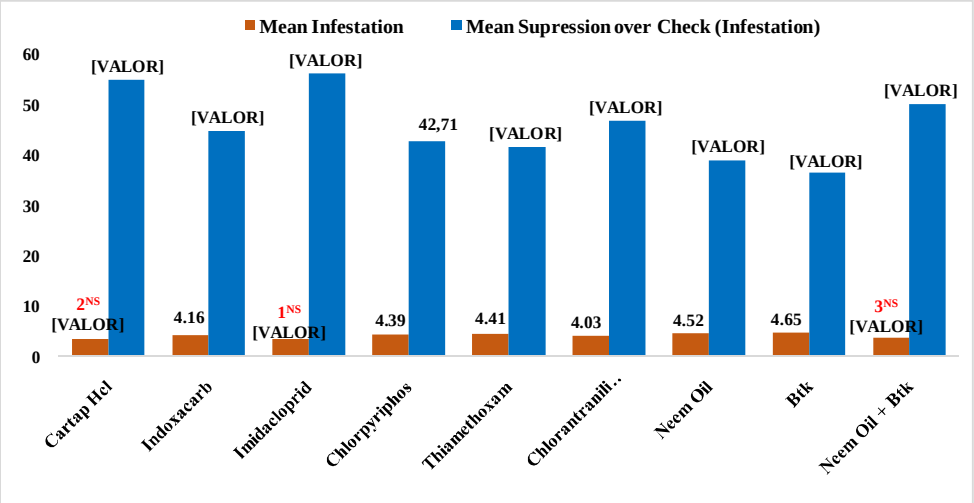

Table2. MeanEvaluation of Ecofriendly Insecticides for Major Insect Pests (Pooled of 2014 & 15)* (% Infestation (Infestation) and % Suppression of Infestation over Check (SPOC))

Treatments	First Application (Mean)		Second Application (Mean)		Total Mean SPOC DAAp	Total Mean Infestation DAAp	Mean Yield (q/ha)
	SPOC	Infest	SPOC	Infest			
1.Cartap Hcl	48.96 $^{2\ NS}$ (6.98)	4.26 $^{2\ NS}$ (2.10)	60.75 $^{1\ NS}$ (7.77)	2.52 $^{1\ NS}$ (1.71)	54.86 $^{2\ NS}$ (7.38)	3.39 $^{2\ NS}$ (1.91)	35.00 $^{1\ NS}$
2.Indoxacarb	39.58 (6.22)	5.10 (2.27)	49.70 (6.96)	3.22 (1.90)	44.64 (6.59)	4.16 (2.09)	31.74
3.Imidacloprid	50.59 $^{1\ NS}$ (7.08)	4.23 $^{1\ NS}$ (2.08)	60.22 $^{2\ NS}$ (7.75)	2.58 $^{2\ NS}$ (1.73)	55.41 $^{1\ NS}$ (7.44)	3.38 $^{1\ NS}$ (1.90)	34.80 $^{2\ NS}$
4.Chlorpyriphos	38.14 (6.03)	5.37 (2.31)	48.38 (6.81)	3.52 (1.97)	42.71 (6.38)	4.39 (2.12)	31.72
5.Thiamethoxam	36.63 (5.96)	5.35 (2.32)	46.08 (6.72)	3.43 (1.95)	41.43 (6.35)	4.41 (2.14)	31.37
6.Chlorantraniliprole	41.32 (6.39)	4.87 (2.23)	52.20 $^{4\ NS}$ (7.09)	3.18 $^{4\ NS}$ (1.90)	46.72 (6.74)	4.03 (2.06)	31.75
7.Neem Oil	33.37 (5.75)	5.41 (2.35)	44.33 (6.53)	3.53 (1.99)	38.91 (6.18)	4.52 (2.18)	31.39
8.Btk	32.11 (5.65)	5.45 (2.36)	40.42 (6.30)	3.82 (2.06)	36.47 (5.99)	4.65 (2.21)	31.18
9.Neem Oil + Btk	43.49 $^{3\ NS}$ (6.60)	4.52 $^{3\ NS}$ (2.17)	56.44 $^{3\ NS}$ (7.48)	2.83 $^{3\ NS}$ (1.80)	49.97 (7.04)	3.68 $^{3\ NS}$ (1.98)	34.28 $^{3\ NS}$
10.Untreated Check	–	7.92 (2.83)	–	6.61 (2.63)	–	7.27 (2.73)	31.02
SE $_{(m)}$	0.20	0.04	0.24	0.06	0.04	0.03	0.25
CD $_{(5\%)}$	0.56	0.12	0.69	0.18	0.11	0.08	0.72
CV $_{(\%)}$	6.98	4.05	7.74	7.26	0.78	1.90	1.33

* Values in parentheses are square root transformation (√ (x + 0.5)) for uniform sample size (Steel and Torrie, 1960); 1,2,3 numerals are rank orders and NS stands for non-significant respectively; Comparison of all data respective to the non-significant lowest insect pest infestation.

Figure2. Mean Evaluation of Ecofriendly Insecticides for Major Insect Pests (Pooled of 2014 & 15). (% Infestation (Infestation) and % Suppression of infestation over Check (SPOC))

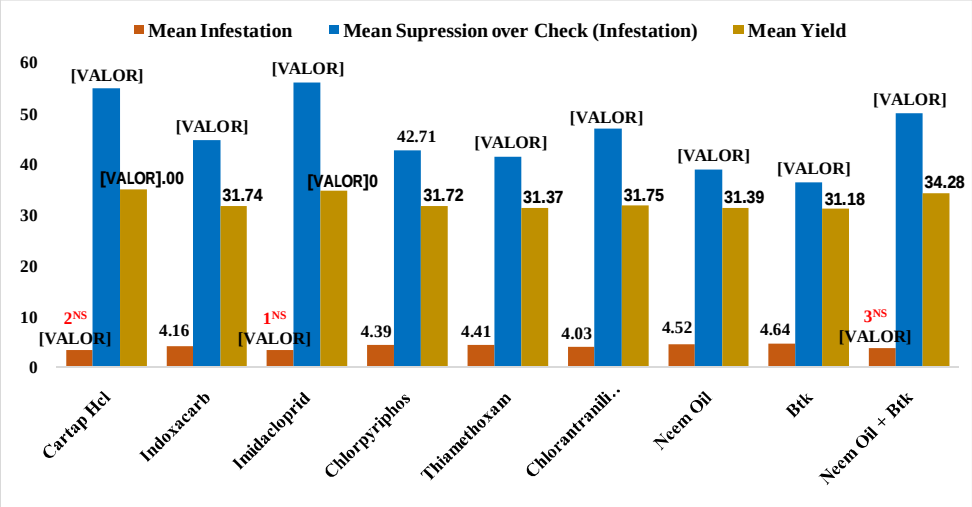

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Table3. Rank Evaluation of Ecofriendly Insecticides for Major Insect Pests (Pooled of 2014 & 15)* (Infestation/ SPOC/ Yield/ Mean)

Rank	Infestation (%) (Lowest)	SPOC (%) (Highest)	Yield (q/ ha) (Highest)	Mean Rank
1	**Imidacloprid** **3.38** [1 NS] (1.90)	**Imidacloprid** **55.41** [1 NS] (7.44)	**Cartap Hcl** **35.00** [1 NS]	**Imidacloprid** **1.33** [1 NS]
2	**Cartap Hcl** **3.39** [2 NS] (1.91)	**Cartap Hcl** **54.86** [2 NS] (7.38)	**Imidacloprid** **34.80** [2 NS]	**Cartap Hcl** **1.67** [2 NS]
3	**Neem Oil + Btk** **3.68** [3 NS] (1.98)	**Neem Oil + Btk** **49.97** (7.04)	**Neem Oil + Btk** **34.28** [3 NS]	**Neem Oil + Btk** **3.00** [3 NS]
4	**Chlorantraniliprole** **4.03** (2.06)	**Chlorantraniliprole** **46.92** (6.76)	**Chlorantraniliprole** **31.75**	**Chlorantraniliprole** **4.00**
5	**Indoxacarb** **4.16** (2.09)	**Indoxacarb** **44.64** (6.59)	**Indoxacarb** **31.74**	**Indoxacarb** **5.00**
6	**Chlorpyriphos** **4.39** (2.12)	**Chlorpyriphos** **42.71** (6.38)	**Chlorpyriphos** **31.72**	**Chlorpyriphos** **6.00**
7	**Thiamethoxam** **4.41** (2.14)	**Thiamethoxam** **41.43** (6.35)	**Neem Oil** **31.39**	**Thiamethoxam** **7.33**
8	**Neem Oil** **4.52** (2.18)	**Neem Oil** **38.91** (6.18)	**Thiamethoxam** **31.37**	**Neem Oil** **7.67**
9	**Btk** **4.65** (2.21)	**Btk** **36.47** (5.99)	**Btk** **31.18**	**Btk** **9.00**
$SE_{(m)}$	**0.03**	**0.04**	**0.25**	–
$CD_{(5\%)}$	**0.08**	**0.11**	**0.72**	–
$CV_{(\%)}$	**1.90**	**0.78**	**1.33**	–

***** Values in parentheses are square root transformation ($\sqrt{(x + 0.5)}$) for uniform sample size (Steel andTorrie, 1960); 1,2,3 numerals are rank orders and NS stands for non-significant respectively; Comparison of all data respective to the non-significant lowest insect pest infestation.

Comment [U35]: TABLE 3 MUST GO TO THE SIGNED PLACE, UPPER..

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CONCLUSION OK.

The infestations of major insect pests of rice were observed for most serious insect pests, which were 1.Yellow stemborer (*Scirpophagaincertulus* Walker), 2.Common rice leaffolder (*Cnaphalocrosismedinalis*Guenee), 3.Brown planthopper (*Nilaparvatalugens*Stal), 4.Rice hispa (*Dicladispaarmigera* Oliver), and 5.Rice earhead bug (*Leptocorisaacuta*

Thunberg).The inferences of suppression over check were based on non-significant ecofriendly insecticidesfor lowest infestation.There were 3 insecticides (Cartap Hcl, Imidacloprid, and Neem Oil + Btk) inference non-significant for lowest infestation and highest yield respectively.The mean ranking and inference of suppression over check were similar to inference of non-significant ecofriendly insecticides for lowest infestation as, Imidacloprid, Cartap Hcl, and Neem Oil + Btk respectively.Though, all these 3 insecticides were being most effective ecofriendly insecticides as, the Imidacloprid and Cartap Hcl are chemical insecticides, while Neem Oil + Btkare the biological insecticides (biorationals). Hence, Neem Oil + Btk as biorationals primarily would be the best choice before Imidaclopridand Cartap Hcl for the ecofriendly management of major insect pests of rice.

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Comment [U38]: WRONG. IT IS NOT IN ALPHABETICAL ORDER BUT IN ORDER OF APPEARANCE IN THE TEXT. MUST BE NUMBERED 1,2,3,4 ETC.

IN THE FIRST REFERENCE: THE YEAR MUST BE PLACED AFTER THE NAME OF THE JOURNAL. REVISE AND ARRANGE ALL REFERENCES.

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