Original Research Article

EfficacyofSelectedinsecticides,Beaveriabassina,Neemoilagainst Diamondbackmoth(Plutellaxylostella)(L.)inCabbage(Brassica oleraceavarcapitata).

AB STR ACT

InordertodeterminetheEfficacy ofSelectedinsecticides,Beaveriabassiana, Neemoilagainst Diamondbackmoth(Plutellaxylostella)oncabbageunderAllahabadconditions,prayagraj, Uttarpradesh.TheexperimentwaslaidoutinRandomisedblockdesignwitheighttreatments. Eachreplicatedthriceusingavariety Greensoccer546.ThetreatmentsareSpinosad45%SC,Indoxacarb14.5%SC,EmamectinBenzoate5% SG,Chlorantaniliprole18.5SC,Fipronil5%SG ,Beaveriabassiana,Neemoil0.3%alongwithanuntreatedcontrolagainst Diamondback moth(Plutellaxylostella)incabbage.ThedataonMeanlarvalPopulationofDiamondback mothovercontrolonfirstandsecondspray overallmeanrevealedthattreatments significantly superiorovercontrol. Among alltreatments Chlorantraniliprole18.5SCrecordedlowestnumber ofLarvaofDiamondbackmoth(1.78),whichwassignificantlysuperiorovercontrolfollowed by Spinosad45%SC (2.03),Indoxacarb14.5SC (2.25), EmamectinBenzoate 5%SG(2.39), Fipronil5%SC(2.63),Beaveriabassiana(1x 10^8 CFU/gm(2.72),Neemoil0.3%(3.1) recorded highestNumberoflarva.WhiletheHighestyield314.9q/hawasobtained fromthe treatmentChlorantraniliprole18.5SCaswellasB:Cratio(1:7.59)obtained highfromthe treatmentwasfollowedbySpinosad45%SC(1:6.77),Indoxacarb14.5SC(1:6.33),EmamectinBenzoat e5%SG(1:5.25),Fipronil5%SG(1:5.78) ,Beaveriabassiana(1x108CFU/gm) (1:5.50),Neemoil0.3%(1:4.72)ascomparedto control(1:4.32).

Comment [H1]: The highest or lowest value in the summary is only valuable when you suggest a result. What was achieved at the end of the study and what do you recommend?

Comment [H2]: Please pay attention to spelling rules and punctuation

INTRODUCTION

Cabbage isoneofthemostpopularColevegetablecropinIndia. Itisknowntopossess medicinalpropertiesanditsenlargeterminalbuds isarichsource of Ca,P,Na,K,S,VitaminC anddietaryfibre.Itissaidtobegoodforpersonsuffering fromdiabetes.Itmay beusedfor preparesoup,stew,asstuffingforcake.(Norton1997).Indiaisthesecondlargestproducer of cabbageafterchina.Indiaisproducingabout8755000tonnesinanareaof388000/ha witha productivityof22,564(kg/ha).InUttarpradesh cabbageisgrowninanareaofabout0.72million haproducing5.7milliontonnes.

Comment [H3]: Please add reference

Thebrassicacrophasmultipleinsectpestcomplex.Atotalof37insectpestshave been reportedto feedoncabbagein india.(Lal,1975).Theimportantinsectpestsspeciesare Diamond backmoth(Plutellaxylostella)(L.),Cabbage caterpillar(PierisbrassicaeLinneaus),Cabbage semilooper(ThysanoplusiaorchalceaFabricus)and(AutographanigrisignaWalker),Tobacco caterpillar(SpodopteralituraFabricus),Cabbageleafwebber(CrocodolomiabinotalisZeller),Cabbageborer(HellulaundalisFabricus),Cabbageaphid(Brevicoryne brassicaeW.)

Diamondbackmothisthemostdestructive pest(Kumaretal.,2007)andislimitingfactorfor successfulcultivationofcruciferouscrops(Raietal.,1992).Kumaretal.,1983reported52%of lossinmarketableyieldduetotheattackofPlutellaxylostella(L.)andlossofUS$16Million peryear.Thishasnecessitatedtheuseofalternativeeco-friendly insecticidestosustainthe management ofdiamondbackmothandthedevelopment ofresistanceagainstthesetraditional insecticidescanbeeasilybreakdownbyusingthenewergroupofmolecules.

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Diamondbackmothhasdevelopedresistanttoalmostallthegroupofchemicalpesticides.In viewoftheundesirableeffectsduetounilateraldependence onconventionalchemicals,recent advancesinresearcharedirectedtowardsdevelopment ofsaferandeffectiveinsecticidesi.e. avermectins,microbes, pyrazoles, spinosynsand biopesticideswhich are relativelysafe to naturalenemiesandreducespesticideloadinenvironmentandreportedthatthesemolecules sparegoodnumberofcoccinellidbeetles,spidersandChrysoperla.(Dhanalakshmietal.,2008). Hencethepresentstudywasundertaken,‘‘Efficacyof Selectedinsecticides,Beauveriabassiana, Neemoilagainstdiamondbackmoth Plutellaxylostella(L.)incabbage(Brassicaoleraceavar. capitata)andtoCalcualateCostBenefitratio.

MaterialsandMethods:

Theexperiment wasconductedduringrabiseasonatCentralResearchField(CRF)ofSam HigginbottomUniversityof Agriculture, Technologyand Sciences, Naini, Prayagraj,Uttar Pradesh,India,inarandomized blockdesignwitheighttreatmentsreplicatedthreetimesusing varietyGreensoccer546inaplotsizeof(2m×2m)ataspacingof(60×45cm) witha recommended packageofpracticesexcludingplantprotection.TheEfficacy ofSelected Insecticides ,onebiopesticide i.e.Beauveriabassiana(Almax)andonebotanicali.e.,Neemoil and five insecticidesi.e., spinosad (Tracer), Indoxacarb(oxadizine), Emamectin benzoate (Rebel),Chlorantraniprole (coragen),Fipronil(Regent)werepurchasedfromlocalpesticide traders.Forcomparison untreatedcheckwasincluded.Application oftreatmentswasstartedas soonasthepestlevelcrossedtheETLi.e.,5-6larvaeperplantthesecondspray wasgivenafter 15daysrespectively.

Theinsectpopulationwascountfromrandomlyselectedplantineveryplotandpopulationper 5plantswasnoted.Afterthatmeanofthreereplicationswascalculatedforeachtreatmentand thesamewasdonewiththeuntreatedplot.ThepopulationofPlutellaxylostella wasrecorded before1dayspryingandon3rdday,7thdayand14thdayafterinsecticidalapplication.

$$\text{Larval population} = \frac{\text{No. of. Infested plants}}{\text{Total number of randomly selected plants}}$$

Healthycabbageheadswereharvested whentheyreachedappropriatemarketablesizeandtheir weight from each treatmentwasexpressedas marketable yield in quintalperhectareand subjectedtoanalysisofvariance.ThedatacollectedonlarvalpopulationofDiamondback moth (Plutellaxylostella) weresubjectedtostatisticalanalysisfortestingthelevelofsignificance. Similarly,thereplicationwisedataofeachtreatmenton yieldofcabbageheadwerealso subjectedtoanalysisof variance.Costeffectivenessof eachtreatmentwasassessedbased onnet returns.Netreturnofeachtreatmentwasworkedoutbydeductingtotalcostofthetreatment fromgrossreturns. Totalcostofproductionincludedbothcultivationaswellasplantprotection charges.

RESULTSANDDISCUSSION

Thedata on Meanlarvalpopulationoverallmean showsthatallthetreatmentsweresignificantly superiorovercontrol.AmongthetreatmentsT$_4$ Chlorantraniliprole18.5%SCrecordedbest effectiveforDiamondback moth(DBM)larvalpopulationhadshowinglessnumberoflarva (1.78)followedbyT$_1$ Spinosad45SC(2.03),T$_2$ Indoxacarb14.5SC(2.25),T$_3$ Emamectin Benzoate5%SG(2.39),T$_5$ Fipronil5%SC(2.63),T$_6$ Beauveriabassiana(1X10^8 CFU/gm) (2.72),T$_7$Neemoil0.3%(3.15)andT$_0$control(7.52)

Alltheinsecticideswerefoundveryeffectiveandsignificantlysuperiorovercontrol.Thedata onMarketableyieldrevealedthatT$_4$ Chlorantraniliprole 18.5%SCrecordedbesteffectivefor Diamondbackmoth(DBM) withayield(283.6q/ha)theseresultssupported byNikam(2013) followedbyT$_1$Spinosad45SC(273.71q/ha)theseresultssupportedbyMandal etal.,(2009),T$_2$ Indoxacarb14.5SC(233.48q/ha)theseresultsaresupportedbyJaishreebanjaree(2017),T$_3$ Emamectinbenzoate5%SG(221.72q/ha)theseresultsaresupportedbyADetal(2018),T5 Fipronil5%SC(211.27q/ha)theseresultsaresupportedbyDeivendranetal.,(2007),T6 Beauveriabassiana(1X108CFU/gm)(201.57q/ha)theseresultssupportedbyShelton etal., (1998),T7 Neemoil0.3%(194.90q/ha)these resultssupportedbyDevietal.,(2017) andT0 control(165.15q/ha).

AmongbestandmosteconomicaltreatmentT$_4$ Chlorantraniliprole18.5%SCrecordedhighest Diamondback moth (DBM) CBR(1:7.59)these results supported by Purushotam(2016) followed by T$_1$ Spinosad45SC (1:6.77)theseresults are supported by Sharma(2020),T$_2$ Indoxacarb14.5SC (1:6.33)theseresultssupportedbyNikhitaetal.,(2021), T$_3$ Emamectin Benzoate5%SG(1:5.25)these resultssupportedbyAkbaretal.,(2021)T$_5$Fipronil5% SC(1:5.78)these results supported by Nikhilet al.,(2020),T$_6$ Beauveriabassiana(1X10^8 CFU/gm) (1:5.50)theseresults are supportedby Shelton et al.,(1998), T$_7$ Neem oil 0.3% (1:4.72)theseresultsaresupportedbyDevietal.,(2017)andT$_0$control(1:4.32).

Comment [H5]: If there is no conclusion section, the findings and recommendations of the study should be mentioned at the end of the results and discussion section.

Comment [H6]: Applications are not mentioned in the Material Method section. (T_1, T_{2etc})

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Table.1.Efficacyofselectedinsecticides,Beauveriabassiana, neem oil against diamond back moth (Plutellaxylostella)in cabbage (Brassica oleraceavar. capitata)Larvalpopulation (1st sprayand2nd spray)

LarvalPopulation /Plant								
		1st spray			2nd spray			Cummulative Mean
	TREATMENTS	3DAS	7DAS	14DAS	3DAS	7DAS	14DAS	
T_1	Spinosad45SC	2.8	2.2	2.6	2.00	1.26	1.33	2.03
T_2	Indoxacarb 14.5SC	3.06	2.46	2.86	2.26	1.46	1.53	2.25
T_3	Emamectin Benzoate5%SG	3.2	2.6	3	2.40	1.53	1.66	2.39
T_4	Chlorantraniliprole 18.5%SC	2.6	2	2.4	1.80	1.00	0.93	1.78
T_5	Fipronil5%SC	3.46	2.86	3.26	2.66	1.80	1.80	2.63
T_6	Beauveria bassiana(1X108 CFU/gm)	3.6	2.93	3.33	2.80	1.86	1.86	2.72
T_8	Neemoil0.3%	4	3.4	3.8	3.20	2.33	2.20	3.15
T_0	Control	6.86	7.33	7.53	7.6	7.8	8.00	7.52
	SEm+_	0.12	0.14	0.11	1.35	0.94	0.18	-
	CDat5%	0.28	0.25	0.31	0.24	0.23	0.24	-

Fig:1 Efficacy of selected insecticides, Beauveriabassiana, neem oil against diamond back moth (Plutellaxylostella)on cabbage (Brassica oleraceavar. capitata)Larvapopulation (1st sprayand2nd spray).

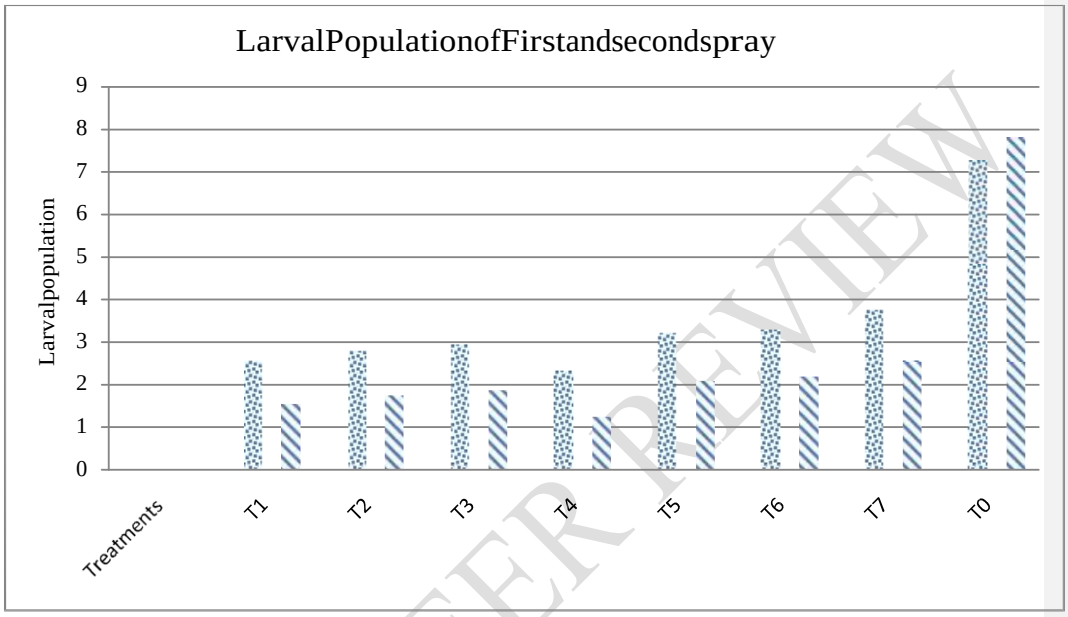

Table.2. EconomicsofCultivation:

Sr. No:	Treatment	Yield q/ha	Costof yield q/(₹)	Total costofyield(₹)	Common cost(₹)	Treatment cost (₹)	Net profit	Total Cost	B:C Ratio
T_1	Spinosad45SC	273.71	750	205283	26494	3800	174989	30294	1:6.77
T_2	Indoxacarb 14.5SC	233.48	750	175110	26494	1145	147471	27639	1:6.33
T_3	Emamectin Benzoate5% SG	221.72	750	166290	26494	5175	134621	31669	1:5.25
T_4	Chlorantraniliprole 18.5%SC	283.61	750	236183	26494	1495	186206	27989	1:7.59
T_5	Fipronil5%SC	211.27	750	158453	26494	910	131049	27404	1:5.78
T_6	Beauveria bassiana(1X108 CFU/gm)	201.57	750	151178	26494	980	123704	27474	1:5.50
T_7	Neemoil 0.3%	194.9	750	146175	26494	4425	115256	30919	1:4.72
T_0	Control	165.15	750	135863	26494	-	109369	26494	1:4.32

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