Original Research Article

"Efficacy of the plant extracts as grain protectants against rice weevil *Sitophilus oryzae* on stored wheat grains''

ABSTRACT

The present investigation wereconductedatdepartment of EntomologySHUATS,Prayagraj during2021-2022 using completely randomized design with three replications and treatments neem leaf powder, turmeric rhizome powder,clovepowder, pepperpowder, mustard oil,soybean oil andgroundnutoil.Amongtheselectedoilsandbotanicals treated to wheat grains, mustard oil and soybean oil were found to be highlyeffective in increasing adult mortality (100 %) and reducing the per cent weight loss (0.00%)in stored wheat grains. Turmeric rhizome powder was found to be least effective among allthetreatments.Themaximumgerminationpercentage,vigourindex1andvigourindex2wasobserved in grains treated with mustard oil (90%, 2250.00, 123.00) respectively on wheatgrains.Turmericrhizomepowderwas foundtobeleasteffectiveamongallthetreatments.

Key words: Clovepowder, Pepperpowder, Mustard oil,Soyabean oil,Groundnutoil.

INTRODUCTION

Wheat (*Triticum aestivum* L.), an individual from the Graminae family, is the world's most significant oat crop, positioning second in worldwide grain creation behind maize and third behind rice. With 95.91 million tons of wheat delivered, India is the world's second biggest wheat maker (FAO, 2014). Wheat is wealthy in sugars (55%) and it meets 20% of worldwide calorie necessity (Breiman and Graur, 1995). Aside from carbs, wheat grains have a protein content of 10-18%, which is far higher as contrasted and different oats. Interest for wheat and its items is likewise ascending with populace and change in food propensities (World Bank, 1989).

Wheat is a rabi season crop with a worldwide creation of 694 million metric tons (Ahmad *et al*., 2017). Wheat stands firm on a critical foothold in India's economy (Chowdhury et al., 1998). It was the second most delivered oat in India with an expected creation of 98.6 million MT during 2017-18. The extension of food creation has brought about various post-gather issues, the most serious of which being irritation pervasion during capacity (Khalequzzaman and Khanom, 2006).

Appropriate biological knowledge is required for the development of an effective management strategy. Keeping in view the importance of the crop and huge losses caused by stored insect *Sitophilus oryzae* to wheat, the present study was carried for study the biology of *Sitophilus oryzae* and its incidence in different varieties ofstored wheat with the following objectives.: 1. To study the effect of plant extracts on the mortality and percentweight loss of treated wheat grains. 2. To evaluate percent germination and seed vigour of stored wheat grains.

Rice weevil, (Sitophilus oryzae L) [Coleoptera: Curculionidae] is one of the serious pestof wheat andalso feeds on rice, corn, oat, grain, sorghum, buck wheat ear and their items. It presently has a cosmopolitan circulation. The life stagescomprises of four phases: egg,

hatching, pupa and adult. The rice weevil is small, 1/10 inch (2 to 3 mm) and heavy for all intents and purposes. It is basically the same in appearance to the storehouse weevil. Notwithstanding, the rice weevil is rosy brown to dark in variety with four light yellow or ruddy spots on the sides of the elytra (the hard defensive forewings). The snout is long (1 mm), right around 1/3 of the complete length. The head alongwith snout is as long as the prothorax or the elytra. The prothorax (the body district behind the head) is unequivocally hollowed and the elytra have columns of pits inside longitudinal scores. The hatchling is legless and stays inside the emptied grain bit. It is fat with a cream hued body and dim head container (Koehler, 2008).

Stored grain resistance may be employed alone or in combination with other protective techniques in areas where storage facilities are insufficient. In terms of storage insect resistance, there has been a lot of diversity documented in grains. Resistance breeding, on the other hand, has a lot of potential because it is both sustainable and environmentally benign, as well as a cost-effective way to reduce post-harvest losses caused by storage pests (**Mwololo *et al.* 2013)**. Appropriate biological knowledge is required for the development of an effective management strategy.

MATERIALSANDMETHODS

Thelaboratoryexperimentsonthebiologyandmanagementof Riceweevil(*Sitophilus oryzae*)instoredwheatwasconducted during 2021-22 in the Dept. of Entomology, SHUATS, Prayagraj, UP involving Completely Randomized plan with eight treatments in Wheat assortment WH-542. The Culture of Rice weevil (Sitophilus oryzae) was started by gathering the grown-up weevils from the plagued wheat and maize grains from the nearby market. The way of life was additionally kept up with in glass container of 2 kg limit containing the wheat grains. Mouth of the holder was closed with muslin cloth and tied with rubber band. New grains were presented occasionally for appropriate advancement of weevils. with the consequent generation was utilized for the experiment purpose.

The plant extracts i.e., neem leaf powder (*Azardiracta indica* L.), turmeric rhizome powder (*Curcuma longa*), pepper powder (*Piper nigrum*), clove powder (*Syzygium aromaticum*), mustard oil, soyabean oil, groundnut oil were brought from nearby business sectors.Topreparetherequiredquantity@5%concentrationofthetreatments,5gmofeachpowdera nd5mlof mustard,soyabean,Groundnut oils wereadded separately to 1 kgof wheatseeds.Hundred grams of solid seeds of wheat assortment (WH 542) were entirely blended in various oils and botanicals acquired from nearby market and set in isolated plastic boxes treatment wise. The holders were covered with muslin material and secured with an elastic band. Untreated seed act as control. Ten sets of newly arisenadults were transferred in each replication. Grown-up mortality, percent weight reduction, germination rate, power list 1 and energy record 2 were noted.

Mortality wasrecorded as when the scarab didn't answer delicate tension utilizing a fingertip. The quantity of dead bugs were recorded following 3, 7 and 10 days of treatment individually. The perception on percent weight reduction was recorded by counting the quantities of uninfested seeds and swarmed seeds.

The seed germination tests are completed utilizing moved paper towel test as per International Rules of Seed Testing. Germination trial of the treated seeds was completed independently at 30, 60, 90 days time frame treatment from plagued and un invaded treated wheat. Germination trial of the treated seeds is completed by taking 15 wheat seeds in three-fold.

For assurance of seedling power 1, 10 ordinary seedlings were chosen arbitrarily from each replication and treatment toward the finish of germination test. The root and shoot length of each one of the seedlings were estimated in cm and normal seedling length was estimated. The seedling power record was determined by duplicating germination rate with seedling length (cm)

Normal dry load of 10 ordinary seedlings is determined and communicated as

seedling dry load in grams. The seedling force list 2 was determined by duplicating germination (%) with seedling dry weight (gm).

RESULTSANDDISCUSSION

Different treatments with plant extracts were better than untreated controlas they showed more percent mortality. The vast majority of the treatment uncovered fundamentally higher mortality at 10-day of openness when contrasted with the control. Greatest mortality brought about by 5% mustard oil treatment followed by soybean oil . As a general rule, death rate was expanded with expanding the centralization of plant concentrates and openness time. Among various plant removes, the grains treated with 5gm clove powder separate created low mortality followed by turmeric rhizome powder. Besides, both mustard oil and soybean oil (5%) caused high mortality of 100 percent and 100 percent individually contrasted with other plant extricates following 10 days. Least mortality (18.33 percent) was observedin grains treated with 5% clove powder followed by turmeric powder(10%) following 3 days.

After 3 Days After Treatment the botanicals T6 soybean oil and T7 Groundnut oil were non-important to one another and critical over control.Similarly, After 10 DAT T7 Groundnut oil, T6 Soyabean oil and T5 Mustard oil were non-important to one another and huge over control.

Each one of the treatments were better than control in percent weight reduction. Results on the impact of various plant extricates on the percent weight reduction of wheat seeds are recorded following 30,60,90 days after the treatment. Different endlessly plant part separates meaningfully affected percent weight reduction of wheat seeds. Among the concentrates, the most noteworthy percent weight reduction (35.33%) was found in untreated wheat seeds followed by turmeric rhizome powder(21.33%) following 90 days of treatment and least was seen in mustard oil(00%) and soyabean oil(00%) following 30 days of treatment. No weight reduction was kept in Mustard oil and Soyabean oil treated grains following 30,60,90 days of treatment. percent weight reduction of wheat seeds expanded continuously with expansion in no.of long periods of treatment.

Factual examination showed that following 30,60,90 days of treatment weight reduction of case differed altogether which shows the adequacy of admixtures against bug attack.Botanicals T6 Soyabean oil and T5 Mustard oil were non-signifcant to one another and better over the control.

Results on the impact of various plant extracts on the percent germination of wheat seeds wasrecorded on 30,60 and, 90 days after the treatment. Among the concentrates, the most noteworthy germination (93%) was found in wheat seeds treated with mustard oil followed by soyabean oil(91.66%) following 30 days of treatment and least was seen in turmeric rhizome powder(79%) following 90 days of treatment. The outcomes on germination uncovered no tremendous contrasts among treatments as long as two months after treatment burden. Germination of wheat seeds diminished slowly with expansion in no.of long periods of treatment. Each one of the tried plants showed no unfavorable impact on germination of seeds as long as 90 days of treatments.

Each one of the treatments are better over the control and the treatments T5 Mustard oil and T6 Soyabean oil were found than be genuinely at standard with one another.

The vast majority of the treatments uncovered most elevated energy record 1 at 30-day of openness when contrasted with the control.Highest force file 1caused by 5% mustard oil treatment followed by soyabean oil .Among various plant removes, the grains treated with 5gm clove powder(1479.00) extricate delivered Lowest power file 1followed by turmeric rhizome powder(1369.33) following 90 days of treatment. Moreover, both mustard oil and soyabean oil separates (5%) caused most elevated energy list 1 of (2753.00) and (2261.00) individually contrasted with other plant removes following 30 days of treatment.

The statistical information showed that each one of the treatments are better over the control and the botanicals T1 neem leaf powder and T7 Ground nut oil and T4 clove powder and T2

Turmeric powder are found to be statistically at par with one another.
A large portion of the treatments uncovered most elevated life file 2 at 30-day of openness when contrasted with the control.Highest force record 2 brought about by 5% mustard oil treatment followed by soyabean oil .Among various plant removes, the grains treated with 5gm clove powder (80.66) extricate created Lowest energy list 2 followed by turmeric rhizome powder(76.36) following 90 days of treatment. Moreover, both mustard oil and soyabean oil extricates (5%) caused most noteworthy force list 2 of (136.40) and (122.23) separately contrasted with other plant removes following 30 days of treatment. The statistical information showed that each one of the treatments are better over the control and the botanicals T1 neem leaf powder and T7 Ground nut oil are found than be statistically at standard with each

The statistical information showed that each one of the treatments are better over the control and the botanicals T1 neem leaf powder and T7 Ground nut oil are found than be statistically at par with one another.

CONCLUSION

On the basis of present investigation response of *Sitophilus oryzae* towards variousbotanicalswerecarriedoutwitheighttreatmentsincludingcontrol.Performanceofthebotanicalswasassessedbasedonthepercentofmortality,andweightloss,percentofgermination, vigor index 1 and vigor index 2. The greater significance of pest control wasshowninmustardoil(5ml)andsoyabeanoil(5ml)followedbygroundnut oil(5ml).However,all the botanicals controlled the weevil infestation effectively compared to control. Moreover,farmers should be advocated to go for seed treatment with botanicals which are eco-friendly,cost effective and free from the health hazards to protect the wheat and maize grains
against*Sitophilusoryzae*itisbelievedthatthepresentfindingswillprovidesomevitalrecommendations on the management of Rice weevil to reduce the loss of grain damage at areasonablylowcost.

Sr.No.	Treatments	PercentMortality			PercentWeightLoss			Germination%		
		3DAT	7DAT	10DAT	30DAT	60DAT	90DAT	30DAT	60DAT	90DAT
T_1	Neemleafpowder	41.66	68.33	83.33	4.33	9.33	12.33	89.33	86.33	84.33
T_2	Turmericrhizomepowder	10	20	21.66	12.66	18.33	21.33	86.66	82.33	79.00
T_3	Pepperpowder	31.66	58.33	81.66	7	10.66	15	88.33	84.00	82.33
T_4	Clovepowder	18.33	26.66	41.66	10.66	15.66	19	88.00	83.33	80.66
T_5	Mustardoil	90	100	100	0.00	0.00	0.00	93.00	91.33	90.00
T_6	Soyabeanoil	60	80	100	0.00	0.00	0.00	91.66	89.00	88.00
T_7	Groundnut oil	50	78.33	90	2.33	6.33	9.66	90.00	88.00	85.33
T_8	Untreatedcontrol	0.00	0.00	0.00	19	29	35.33	84.00	80.00	75.00
	SEm±	1.021	1.179	1.179	0.236	0.264	0.312	0.236	0.236	0.312
	CD(P=5%)	3.086	3.564	3.564	0.713	0.797	0.943	0.713	0.333	0.943
	CV(%)	4.688	3.783	3.150	5.832	4.086	3.835	0.459	0.478	0.650

S.no	Treatment	Vigori ndex1			Vigori ndex2		
		30DAT	60DAT	90DAT	30DAT	60DAT	90DAT
1	Neemleafpowder (T1)	2024.66	1754.33	1687.00	111.00	105.60	93.86
2	Turmeric rhizome powder(T2)	1589.00	1427.00	1369.33	86.66	82.33	76.36
3	Pepperpowder(T3)	1943.33	1764.00	1509.33	108.93	98.00	87.80
4	Clove powder(T4)	1672.00	1472.00	1479.00	96.80	91.66	80.66
5	Mustardoil(T5)	2573.00	2405.00	2250.00	136.40	133.93	123.00
6	Soyabean oil(T6)	2261.00	2017.33	1906.66	122.23	115.70	105.60
7	Groundnutoil(T7)	2070.00	1848.00	1753.33	113.13	105.26	95.56
8	Untreatedcontrol(T8)	1428.00	1253.33	1050.00	81.20	74.66	70.00
	SEm±	20.368	21.758	30.616	3.124	2.014	2.110
	CD(P=5%)	61.589	65.793	92.577	9.446	6.091	6.380
	CV (%)	1.814	2.163	3.267	5.054	3.458	3.989

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