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Efficacy of indigenous plant products on *Corcyra cephalonica* (Stainton) in stored rice grains

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Abstract
The present investigation entitled "Efficacy of indigenous plant products on *Corcyra cephalonica* (Stainton) in stored rice grains" was carried out under laboratory condition which was controlled and maintained at Medinipur during 2020-2021 under the supervision of Dr. Usha Yadav, Assistant Professor, Department of Entomology, SHUATS, Prayagraj, (U.P). The experiment was laid out in completely randomised design with seven treatments which are three replications including T_{1-} Untreated control and *viz.*, T_{1-} Untreated Control T_{2-} Neem leaf powder, T_{3-} Tulsi leaf powder, T_{4-} Karanj leaf powder, T_{5-} Marigold flower powder, T_{6-} Eucalyptus leaf powder, T_{7-} Rynaxypyr (Coragen) on the larval mortality and grain damage and larval orientation of *C. cephalonica*. The result was revealed that the highest larval mortality (81.67)% after 30 DAR both were recorded in neem leaf powder and it was concluded that the neem leaf powder was most effective. The maximum larval orientation towards treated rice grains after 72h on marigold leaf powder (5.67)% and also revealed that the highest grain damage after 30 days was recorded in untreated control (93.33)% and minimum grain damage on both were recorded in neem leaf powder and Rynaxypyr (Coragen) negligible after 30 days and it was concluded that the neem powder was most effective.

Keywords: *Corcyra cephalonica*, larval mortality, larval orientation, grain damaged, rice

Introduction

Rice is a staple food for nearly half of the world's seven billion people However, more than 90 percent of this rice is consumed in Asia, where it is a staple for a majority of the population, including the region's 560 million hungry people (IRRI, 2013). India is world's second biggest rice producer after China. India share in global rice production is about 20%. In India, 44.01 million hectares area is under rice cultivation with production of 105.30 million tonnes with an average yield of 2.39 tonnes/ha. India is the world's 2nd largest producer with approximately 43 mha planted area, accounting for 22% of the world's rice production. The area under rice crop was 30.81 million/ha in 1950-51 which has increased to 43.86 million hectares during 2014-15 which is nearly 142 per cent higher. The rice production has registered an appreciable increase from 20.58 million tonnes in 1950-51 to 104.86 million tonnes during 2014-15, which is nearly 5 times. The yield was 668 kg/ha in 1950-51 which has increased to 2390 kg/ha during 2014-15. Major share of rice production is in Kharif season (Directorate of Economics and Statistics, Government of India - 2015). Rice is the staple food of West Bengal, is stored in the unhusked form for long period of time either for consumption or good purpose. West Bengal is the largest rice producing state in India. Almost half of its arable land is under rice cultivation in the year 2016 the state produced about 15.75 million tonnes of rice over 5.46-million-hectare cultivable area (Ministry of Statistics and Programme Implementation 2015-2016). Post-harvest losses account for about 10% of total food grains due to unscientific storage, insects, rodents, micro-organisms etc., In India, annual storage losses have been estimated 14 - million tonnes worth of Rs. 7,000 crores in which insects alone account for nearly Rs. 1,300 crores. The major economic loss caused by storage insect pests is not always by consumption but also by the amount of contamination. About 600 species of insects have been associated with stored grain products. Nearly 100 species of insect pests of stored products cause economic losses. In India annual storage losses have been estimated14 -million tons of food grain worth of Rs. 7,000 crore every year in which insects alone account for nearly Rs. 1,300 crores. According to World Bank Report (1999), post-harvest losses in India amount to 12 to 16 million metric tons of food grains each year, an amount that the World Bank stipulates could feed one-third of India's poor. Out of these post-harvest losses storage - insects alone account for 2.0 to 4.2 per cent.

(Indian grain storage management & research institute (IGMRI), Hapur (U.P). The pest causes both quantitative and qualitative losses. Storing grain in store houses, to keep them free from being damaged by insect pests is a problem confronted by every householder, whether a cultivator or user. It causes many qualitative losses like the larvae alone damage the grains of rice and wheat, maize by feeding under silken webs. When infestation is high, the entire stock of grains may be converted into a webbed mass. ultimately, a characteristic foul odour develops and the grains are rendered unfit for human consumption. And also causes quantitative losses damaged caused by *Corcyra cephalonica* about 70% in milled rice at 13% moisture. 3rd instar larvae of rice moth damaged up to 90% in many cereals like wheat, millets, rice etc. The major pests of stored grains *viz*., rice weevil, lesser grain borer, Khapra beetle, red flour beetle, cigarette beetle, drug store beetle, pulse beetles Angoumois grain moth, rice moth *Corcyra cephalonica*, nd other pests severely deteorate agricultural stored products and are responsible for worldwide losses of stored grains ranging from 10 to 40 per cent per annum. (Srivastava *et al.*, 2016) [10], (Yadav and Tiwari, 2016) [12]. *Corcyra cephalonica* is a major insect of stored grain and grain products (Hodges, 1979). It is common insect occurs in the humid tropics, especially in South and South-East Asia. It is a major storage pest in India, Thailand, Brazil, Ghana, Myanmar, Sri Lanka, and Indonesia where major cereal crops are rice, maize. It has been reported to breeding on groundnut also. Since they possess such chemicals, utilization of the plant materials in powder form, crude extracts or purified form should be welcomed ecologically as bio-pesticides. Many of the natural plant components are known to act as anti-feedants, depressants and growth regulators or to impair the immune functions of insects (Omar *et al*., 2007) [8]. Hence they have potential to play an important role in the production and post-harvest protection of food grains which are seriously damaged by insect pests. Global concern with the health and environmental impacts of synthetic pesticides, from both consumers and government agencies has led to heightened restrictions and limitations on the use of these products Safety and damage to environment has resulted increasing attention being given to natural products of plant origin for the control of storage pests. It is necessitated to use of indigenous ecofriendly approach such as use of botanicals for management under storage condition. (Jadav, 2002) [4]. public concrrn to over chemical pesticide being compounds of natural origin, no problems with persistence in the environment are anticipated (Gebbinck *et al.*, 2002) [3]. Indiscriminate use of several insecticides in agricultural field creates problem in the natural ecosystem, environmental pollution, pest resistance and health hazards to human etc. through various botanicals based on the intensive use of indigenous plant products and other environmentally safer botanicals considerable success in mitigating the insect pests damage, reduction in the pesticide usage and restoration of ecological balance and cost effective and beneficial to farmers.

Materials and Methods

The studied were carried out at Medinipur, West Bengal under the supervision of Dr. Usha Yadav, Assistant professor, Sam Higginbottom University of Agriculture Technology and Sciences, (SHUATS). It may be found in a latitude 22.4080° N, and longitude 87.3811° E and a height of 23m above sea level. The climate follows hot tropical weather pattern. There was 7 treatment in the trail including untreated control with three replication in Completely Randomized Design with some indigenous botanicals *viz*. T_1: Untreated control, T_2: Neem leaf powder T_3: Tulsi leaf powder, T_4: Karanj leaf powder, T_6: Marigold leaf powder, T_7: Rynaxypyr (Coragen). All the leaves were dried under shed condition in room temperature, then dried leaves were ground into fine powder and sieving through 60 mesh size sieve about 2.0g powder and chemical Coragen 8mg was mixed with 100g rice grains placed in each container and separately for each treatment, freshly hatch larvae released into each container from the nucleus culture cover with muslin cloth and tightened with rubber band. For larval mortality at 6 days interval were observed and for larval orientation towards treated rice grain at 24h,48h and 72h interval were observed and for grain damaged at 15days to 30 days after released of larvae were observed.

Result and Discussion

Larval mortalit: The data on mean larval mortality at 6,12,16,24 and 30 days after release on freshly treated rice grain with different plant products at the rate 2 g/200g grains presented in Table. The data showed that significantly higher larval mortality was recorded in all the plant products as compare to control. The larval mortality gradually increased with the increment in the days of release.

6 Day after release: Data presented in Table1 revealed that larval mortality was ranged from 10 to 100 per cent in different treatments. The significantly highest larval mortality was recorded in coragen (100.00%); while, Neem leaf powder (38.33%) and Eucalyptus leaf powder (35.00%) was found at par with each other; whereas, the lowest larval mortality was recorded in Marigold flower powder with (10.00%). The karanj leaf powder (30.00%) and Tulsi leaf powder (23.33%) also found effective based on larval mortality. The order of efficacy of all plant products were coragen > neem seed powder > eucalyptus leaf powder.>Tulsi leaf powder >karanj leaf powder >Marigold flower powder.

12 Day after release: Data presented in Table-1 showed that the maximum larval mortality was recorded in rice grain when treated with chemical coragen all larvae were died with (100.00 per cent) whereas with Neem leaf powder (43.33) had highest mortality among leaf products; whereas, lowest larval mortality was recorded in marigold flower powder (20.00%) which was found at par with Tulsi leaf powder (23.33%). The neem leaf powder had 43.33 per cent larval mortality which was found at par with Karanj leaf Powder (40.00%).

18 Day after release: Data presented in Table-1 revealed that all larvae were died in coragen treated rice grains. larval mortality was ranged from 28.33 to 100 per cent in all the treatments. All larvae were died in coragen treatment grains. The highest larval mortality among plant product (71.67%) was recorded most significantly in treatments *viz*., neem seed powder and the next most effective treatment was karanj leaf powder with (66.67%) larval mortality followed by eucalyptus leaf powder ranges (45.00). The lowest larval mortality was recorded in Marigold powder (28.33%) followed by tulsi leaf powder (35.00%).

24 Day after release: Data presented in Table-1 revealed that the larval mortality was ranged from from 30 to 100 per cent

in all the plant product treatments. All the larvae were died in chemical coragen treated grains. The highest larval mortality (76.67%) was recorded in neem seed powder among plant products. and followed by karanj leaf powder (71,67%) which was the next effective treatment followed by eucalyptus leaf powder (61.67%). The lowest mortality was recorded in as usual in marigold powder (30.00%).

30 Day after release: Data presented in Table-2 revealed that the larval mortality was varied from 33.33 to 100.00 per cent. All larvae were died, The highest larval mortality was in neem leaf powder (81.67%) among plant products followed by significantly most effective treatment was karanj leaf powder (76.66%) followed by Eucalyptus and tulsi leaf powder caused 66.67 and 50.00 per cent respectively larval mortality at 30 days after release. The lowest larval mortality was recorded in marigold flower powder (33.33%).
This finding is in close conformity with the findings of Pathak and Tiwari (2010) [9] reported controlled 100% larval mortality of *C. cephalonica* with neem seed extract at 0.11% active ingredient (a.i.). Veeranki and Reddy (2004) [11] reported that neem leaf, seed kernel powder and inert dusts (Attapulgite and Palygorskite) as effective treatment against *C. cephalonica* and *S. cerealella*, also support the present findings. Khan and Thakare (1997) [6] who reported that larval period of one week old *Corcyra* larvae was significantly enhanced at 5 percent level when fed on grains treated with neem seed powder at 1.0 percent. This finding also is in close conformity with the findings of Yadav & Tiwari (2016) [12] reported controlled 100% larval mortality of *C. cephalonica* with Rynaxypyr (Coragen). Veeranki and Reddy (2004) [11] reported that neem leaf as effective treatment against *C. cephalonica* and *S. cerealella*, also support the present findings, next best treatment was in karanj leaf powder and eucalyptus leaf powder (76.67%) and (66.67%) respectively at 30DAR supported by Jhala *et al.* (2018) [5] and Meena *et al.* (2016) [7] also supported that neem kernel powder was found most effective treatment.

Table 1: Effect of Plant Products on Larval mortality of *Corcyra cephalonica* in stored rice*:*

S.no	Treatments	Doses per 100g of grains	Percent of larval mortality at				
			6 DAR	12 DAR	18 DAR	24 DAR	30 DAR
1.	Untreated control	---	00.00 (00.00)	00.00 (00.00)	00.00 (00.00)	00.00 (00.00)	00.00 (00.00)
2.	Neem leaf powder	2g	38.33 (38.23)	43.33 (41.14)	71.67 (57.83)	76.67 (61.12)	81.66 (64.67)
3.	Tulsi leaf powder	2g	23.33 (28.84)	23.33 (28.84)	35.00 (36.25)	46.66 (43.07)	50.00 (44.98)
4.	Karanj leaf powder	2g	30.00 (33.19)	40.00 (39.21)	66.67 (55.74)	71.67 (57.83)	76.67 (61.12)
5.	Marigold Flower powder	2g	10.00 (18.42)	20.00 (26.55)	28.33 (32.12)	30.00 (33.19)	33.33 (35.23)
6.	Eucalyptus leaf powder	2g	35.00 (36.25)	35.00 (36.21)	45.00 (42.12)	61.67 (51.73)	66.67 (54.92)
7.	Rynaxypyr (Coragen)	10mg	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)
	S.Em±	-	0.891 (0.571)	0.891 (0.566)	1.091 (0.690)	1.260 (0.788)	1.260 (0.843)
	CD (P=0.05)	-	2.702 (1.749)	2.728 (1.734)	3.342 (2.122)	3.821 (2.412)	3.858 (2.582)
	CV(%)	-	4.596 (2.827)	4.128 (2.619)	3.816 (2.662)	3.950 (2.834)	3.741 (2.914)

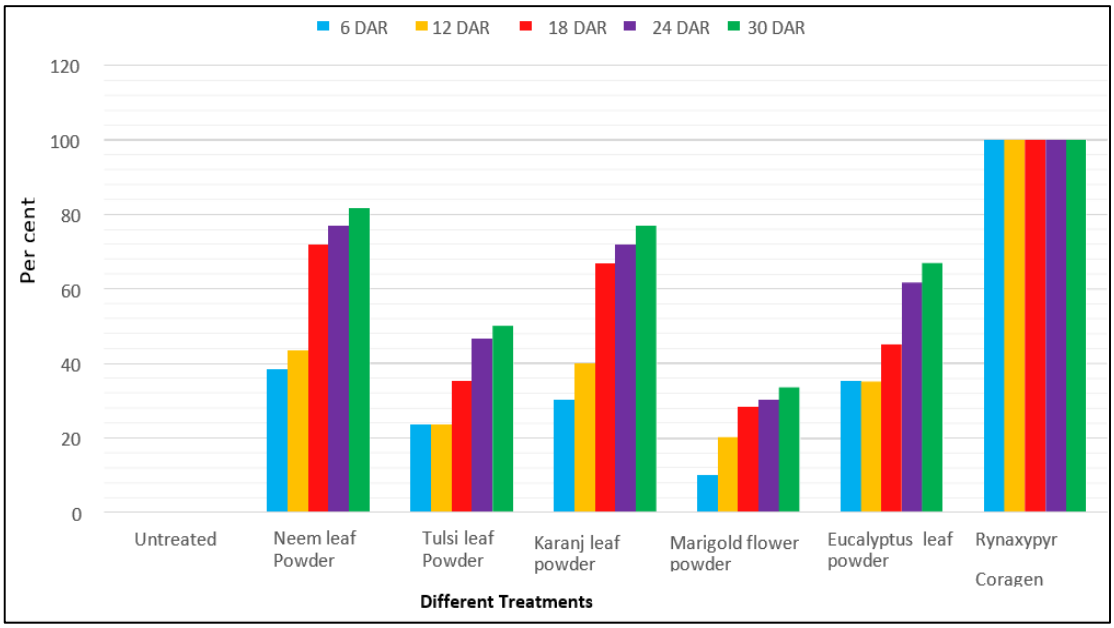

Fig 1: Effect of Plant Products on Larval mortality of *Corcyra cephalonica* in stored rice

Larval Orientation (Choice method): The data given in Table 2. and illustrated through Fig. 2 showed the relative attractancy of 25 days old larvae of *C. cephalonica* towards treated wheat grains after 24, 48 and 72 h of release. After 24 h of release of larvae of *C. cephalonica*, Rynaxypyr (Coragen) treated rice grains were found highly effective as no any larvae were found oriented towards the treated grains with negligible number of larvae attracted towards neem leaf powder (2.33), Karanj and Eucalyptus leaf powder were also less number were attracted 3.33 and 3.67 respectively. and followed by tulsi leaf powder (4.00), marigold flower powder mixed grains attracted towards grains (4.33). with highest attractancy of larvae was found towards untreated control (8.33).

After 48 h of release of *C. cephalonica* larvae for orientation among the treated rice grains, Larval orientation ranges from (2.00 to 10.33) towards treated grains. movement of no larvae was observed again towards Rynaxypyr Coragen treated rice grains with the least number of rice moth larvae was attracted again towards neem leaf powder (2.00) treated rice. followed by eucalyptus leaf powder and karanj leaf powder (3.33 each), marigold flower powder (4.67) with maximum number of larvae oriented towards untreated wheat grains (10.33). Similarly, after 72 h of release of *C. cephalonica* larvae on treated rice grains, again coragen showed no larval orientation towards them followed by neem leaf powder (2.33), karanj leaf powder (3.33), eucalyptus leaf powder (3.67), Among the treatments, the maximum number of rice moth larvae oriented towards tulsi leaf powder (4. marigold flower powder (5.67), (6.00), and highest in untreated control (11.67).

The orientation of larvae of *Corcyra cephalonica* to rice grains treated with different plant products were superior significantly different over control with negligible of number of adults oriented towards coragen (0.00) at 24, 48 and 72h as supported by (Yadav & Tiwari 2016) [12] followed by and Neem leaf powder (2.33) at 72h as supported by (Yadav & Tiwari 2016) [12] and followed by Untreated control (8.33) at 24h supported by (Yadav & Tiwari 2016) [12].

Table 2: Preferential studies for 3rd instar larvae of *C. cephalonica* in treated rice grains.

S. No.	Treatments	Dose per 100g of grains	Mean number of larvae oriented after		
			24 h	48 h	72 h
1.	Untreated control	…	8.33	10.33	11.67
			(16.74)	(18.73)	(19.96)
2.	Neem leaf powder	2g	2.33	2.00	2.33
			(8.74)	(7.94)	(8.74)
3.	Tulsi leaf powder	2g	4.00	3.67	4.33
			(11.53)	(11.01)	(11.99)
4.	Karanj leaf powder	2g	3.67	3.33	3.33
			(11.01)	(10.49)	(10.49)
5.	Marigold Flower powder	2g	4.33 (11.99)	4.67 (12.45)	5.67 (13.75)
6.	Eucalyptus leaf	2g	3.33	3.33	3.67
	Powder		(10.49)	(10.49)	(11.01)
7.	Rynaxypyr	8mg	0.00	0.00	0.00
	(Coragen		(00.00)	(0.00)	(0.00)
	S.Em±		0.356	0333	0.309
			(0.482)	(0.612)	(0.447)
	CD (P=0.05)		1.081	1.011	0.936
			(1.478)	(1.875)	(1.369)
	CV(%)		16.833	14.968	12.070
			(8.358)	(10.437)	(7.133)

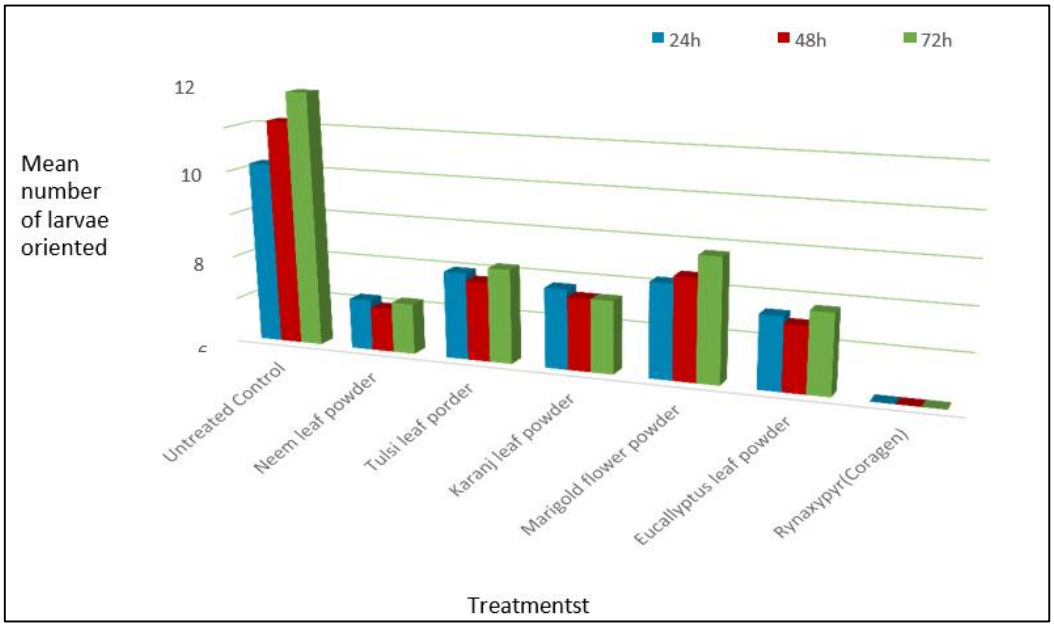

Fig 2: Effect of plant products on larval orientation of *C. cephalonica* towards the treated rice grain in choice test.

Grain damage: To find out the efficacy of eco-friendly products the grain damage due to 15 days larvae of *C. cephalonica* Table No 3. any grain damage was found in coragen after 30 days of treatments (Fig. 3). A significantly minimum grain damage was recorded in neem leaf powder (1.33%) followed by karanj leaf powder (2.67)% and eucalyptus leaf powder (3.33), Tulsi leaf powder (4.67) and in marigold flower powder (7.33) in comparison to untreated control (78.33).

After 30 days of treatments, again damaged grains were not found in coragen treated rice grains and neem leaf powder. The data regarding the per cent grain damage after 30 days of treatments clearly showed the efficacy of plant products with significantly very less grain damage in karanj leaf powder (1.67)%, followed by eucalyptus leaf powder (2.67)% Tulsi leaf powder (4.33%) whereas among other products very significantly less grain damage was recorded in marigold flower powder (12.33)% in comparison to untreated grains (93.33)%.

All the treatments were found to be significantly superior to control in damaged rice grain loss. The negligible weight loss was recorded in Coragen and neem leaf (0.00) this result was supported by Yadav and Tiwari (2016) [12]. and minimum damaged with most effective plant product was Neem leaf powder (00.00) percent, this result was supported by Yadav and Tiwari (2016) [12] which was most significantly different over Untreated control condition (78.33%) this result was supported by Yadav and Tiwari (2016) [12]. The efficacy of neem leaf extract against storage insect pests was reported by Facknath and Sunita (2006) [2], as it acts like a feeding deterrent, repellant and also has growth disrupting effects on the pests. Eucalyptus leaf powder was found to be next treatment the results supported by Dufera *et al.*, (2019) [1].

Table 3: Effects of Plant Products on grain damage of rice grain caused by *Corcyra cephalonica*

S. No.	Treatments	Dose Per 100g of grains	% Grain damage	
			15 days	30 days
1.	Untreated control	-	78.33	93.33
			(62.26)	(75.21)
2.	Neem leaf powder	2g	1.33	0.00
			(6.534)	(0.00)
3.	Tulsi leaf powder	2g	4.67	4.33
			(12.45)	(11.99)
4.	Karanj leaf powder	2g	2.67	1.67
			(9.356)	(7.33)
5.	Marigold Flower	2g	7.33	12.33
	Powder		(15.67)	(20.48)
6.	Eucalyptus leaf powder	2g	3.33	2.67
			(10.49)	(9.35)
7.	Rynaxypyr (Coragen)	8mg	0.00	0.00
			(0.00)	(0.00)_
8.	**SEm±**	-	0.724	0.864
			(0.694)	(0.940)
9.	**CD (P=0.05)**	-	2.195	2.620
			(2.125)	(2.880)
10.	**CV(%)**	-	8.983	9.159
			(7.203)	(9.167)

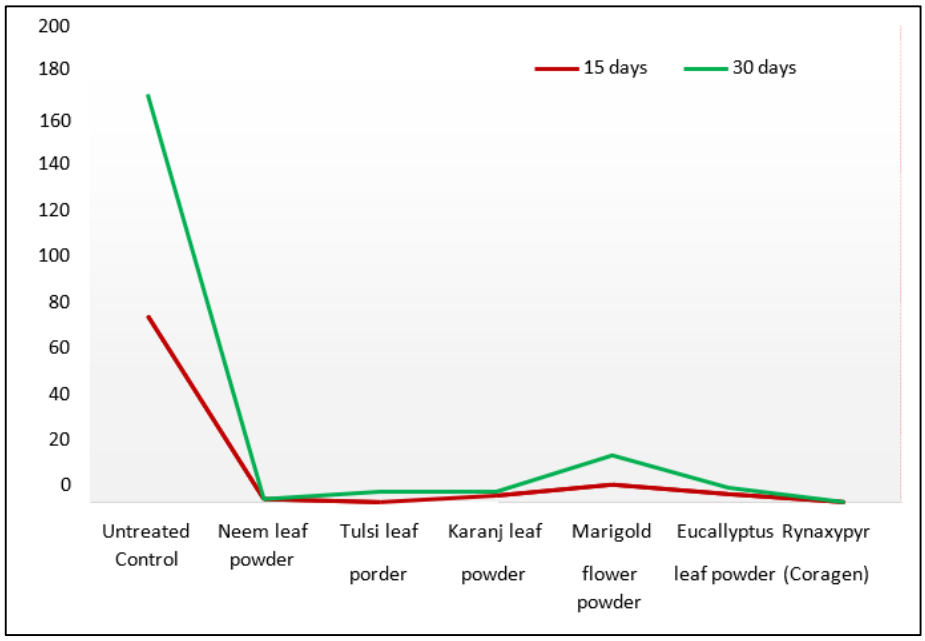

Fig 3: Effect of Plant Products on grain damage of stored rice grains caused by *Corcyra cephalonica*

Conclusion

The findings of the present investigations indicate that the botanical treatments might be useful as insect control agents for the commercial use. All the five botanical treatments tested were effective or the management of *C. cephalonica.* Neem leaf powder @2g/100g of grains and karanj leaf powder @2g/100 of grains were found effective against major insect pest of stored rice as being cost effective, eco-friendly and easy to adopt by small-scale farmers which also can be used as an alternative to synthetic insecticides under storage conditions for shorter duration.

Future scope: As that conclusion are based on investigation conducted over a season in Medinipur, agro-ecological environments, more experiments may be necessary before it could be considered a recommendation.

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Plate 1: A general view of Experimental trials.

Plate 2: Different Treatments

Plate 3: Recording of Larval mortality of *Corcyra cephalonica.z*

Plate 4: Larval orientation towards treated grains (Choice Method)

Plate 5: Damaging symptoms of *C. cephalonica* infested rice with webbing

References

1. Dufera L, Tadesse T, AY, Gobena WS, Kuyu CG. On farm evaluation of *Eucalyptus globulus* Labill leaf and *Chenopodium ambrosioides* L. whole plant powder against storage insect pests in stored maize at Sokoru district in Jimma zone of Oromia regional state, Ethiopia. *Psyche* 2019.
2. Facknath, Sunita. "Combination of neem and physical disturbance for the control of four insect pests of stored products." International Journal of Tropical Insect Science 2006;26(1):16-27.
3. Gebbinck EAK, Jansen BJM, de Groot A. Insect antifeedant activity of clerodane diterpenes and related model compounds. *Phytochemistry* 2002;61:737-70.
4. Jadhav S, Ghule RN. Qualitative changes in total body proteins and haemolymph proteins due to azadiractin in the larvae of *Corcyra cephalonica* (Stainton). *Entomon*. 2002, 2003;28:157-159.
5. Jhala J, Vyas A, Swami H, Mordia A. Efficacy of different plant products against rice moth (*Corcyra cephalonica*, Stainton) in rice. Journal of Entomology and Zoology Studies 2018;6(4):1109-1112.
6. Khan MI, Thakare HS. Effect of selected plant products and entomopathogenic bacteria on develop-ment and control of rice moth, *Corcyra cephalonica* Stainton. Integrated Pest Management in Agriculture 1997, 291-303.
7. Meena BL, Jeengar KL, Singh B, Meena NL. Evaluation of different plant powders as seed protectants against rice moth, *Corcyra cephalonica* Stainton. Journal of Applied

and Natural Science 2016;8(2):910-918.
8. Omar S, Marcotte M, Fields P, Sanchez P, Poveda E, Mata LR, *et al*. Antifeedant activities of terpenoids isolated from tropical Rurales. Journal of Stored Products Research 2007;43(1):92-96.
9. Pathak CS, Tiwari SK. Toxicological effects of neem *Azadirachta indica* A. Juss leaf powder against the ontogeny of *Corcyra cephalonica* (Staint.) (Lepidoptera: Pyralidae). Journal of Biopesticides 2010;3(3):617-621.
10. Srivastava, Chitra, Subramanian S. Status paper. Storage insect pests and their management 2016.
11. Veeranki S, Reddy KD. Evaluation of various products of grain protectants against rice moth in maize. Journal of Research, ANGRAU, 2004;32:24- 33.
12. Yadav, Usha. Eco-friendly management of major insect pest of in stored wheat at Pantnagar, Uttarakhand. Thesis; Doctor of philosophy 2016.
13. http://mospi.nic.in/asi-summary-results/820
14. http://mospi.nic.in/statistical-year-book-india
15. https://eands.dacnet.nic.in/
16. https://igmri.dfpd.gov.in/igmri/insect-pests
17. https://www.irri.org/