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POTENTIAL OF INERT DUST AND IGR'S AGAINST DIFFERENT LIFE STAGES OF RED FLOUR BEETLE (*TRIBOLIUM CASTANEUM*)

Presented by

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- . Red flour beetle is a secondary pest it feed on the broken grains or on the remains of primary pest.
- Experiment was conducted to evaluated the efficacy of inert dust and IGR's against the different life stages of *T. castaneum* through direct feeding bioassay.
- IGR's were tested on 20, 10, 5, 2.5, 1.25, 0.75ppm and white kaolin clay was tested on 30, 25, 20, 15, 10g/kg.
- Two formulations of diatomaceous earth (100% pure food grade and calcium bentonite clay) of dose (400, 500, 600, 700 and 800 mg/kg and 500, 400, 250, 200 and 100mg/kg, respectively) were tested under lab conditions (22±2 °C, R. H. 55±5%, photo period 8 L:16 D).

- Results showed that white kaolin clay gave maximum control followed by Lufenuron> diatomaceous earth (100% food grade)> Methoxyfenozide> DE (calcium bentonite clay)> Pyriproxyfen after 21 days.
- Results also showed that all the treatments are dose and time dependent for the effective control.
- Further research work should be needed on residual studies to detect the deposited chemicals

INTRODUCTION:

- Collectively known as flour beetles, several species of *Tribolium* and *Tenebrio*, *Tribolium castaneum* (Herbst) (Coleoptera: Tenebrionidae) is a cosmopolitan species and one of the most widespread insects in storage facilities worldwide, especially in mills, and it develops most rapidly under favourable conditions.
- The flour beetles are known to attack such a wide variety of foods that they can be said to be practically omnivorous.
- They have been found feeding on over 100 different foodstuffs.
- Their tolerance for hot, dry environments; reduced visual system; and remarkable expansion of odorant and gustatory receptor genes suggests an underground lifestyle in arid subtropical regions, possibly infesting animal food stores.

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MATERIALS AND METHODS:

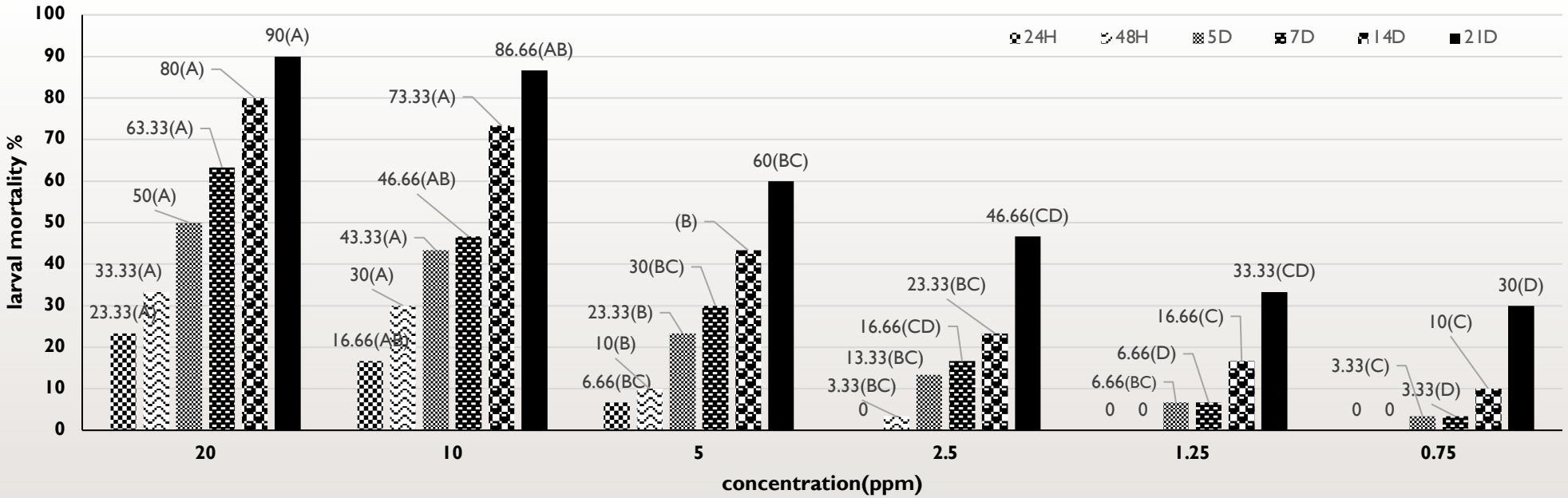
- **Culture of *T. castaneum*:**
- Stock culture of Red flour beetle, *T. castaneum* were obtained from Stored grain laboratory at Entomological Research Institute, Ayub Agricultural Research Institute, Faisalabad. Culture was kept in four glass jars (2.5 L) containing wheat flour and yeast (9: 1) and kept in laboratory conditions 22±2 °C, R. H. 55±5%, photo period 8 L:16 D. The jars were covered with muslin cloth for proper aeration.

- **Insect Growth Regulators:**
- The IGR's used in the study were Pyriproxyfen (JHAs) from Auriga Chemical Enterprises, Lufenuron (CSI) from Dow Agro-Sciences and Methoxyfenozide (ecdysone agonists) from Welkon Chemicals Pvt limited containing 10.8%, 5.6% and 22.6% respectively, of active ingredient.

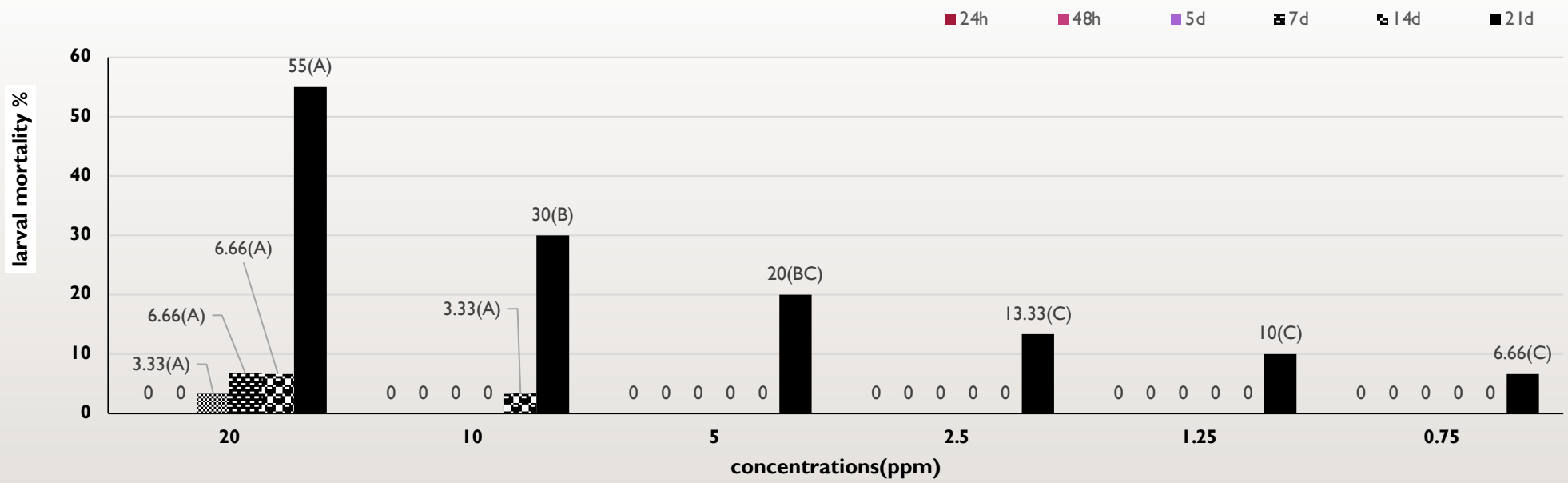
- **Inert dusts:**
- Inert dusts used in the study were 2 formulations of diatomaceous earth and kaolin clay
- Diatomaceous earth (100% pure food grade, NATURESWISDOM) with chemical composition: 80 to 90% silica, with 2 to 4% alumina (attributed mostly to clay minerals) and 0.5 to 2% iron oxide.
- Diatomaceous earth (food grade 1.5 LB, Wolf Creek Ranch) with composition amorphous silica and calcium bentonite($Al_2O_3SiO_2H_2O$)
- White Kaolin clay.

- **Data recorded and analysis:**
- Data were recorded after 24h, 48h, 5days, 7days, 14days and 21 days. The data were corrected by abbot's formula (1925) then the data was analysed by Minitab 15 to calculate the medium lethal concentration(LC_{50}). The percent mortalities were analysed with Statistix version 8.1. Means were compared with post-hawk test at 5% level of significance.

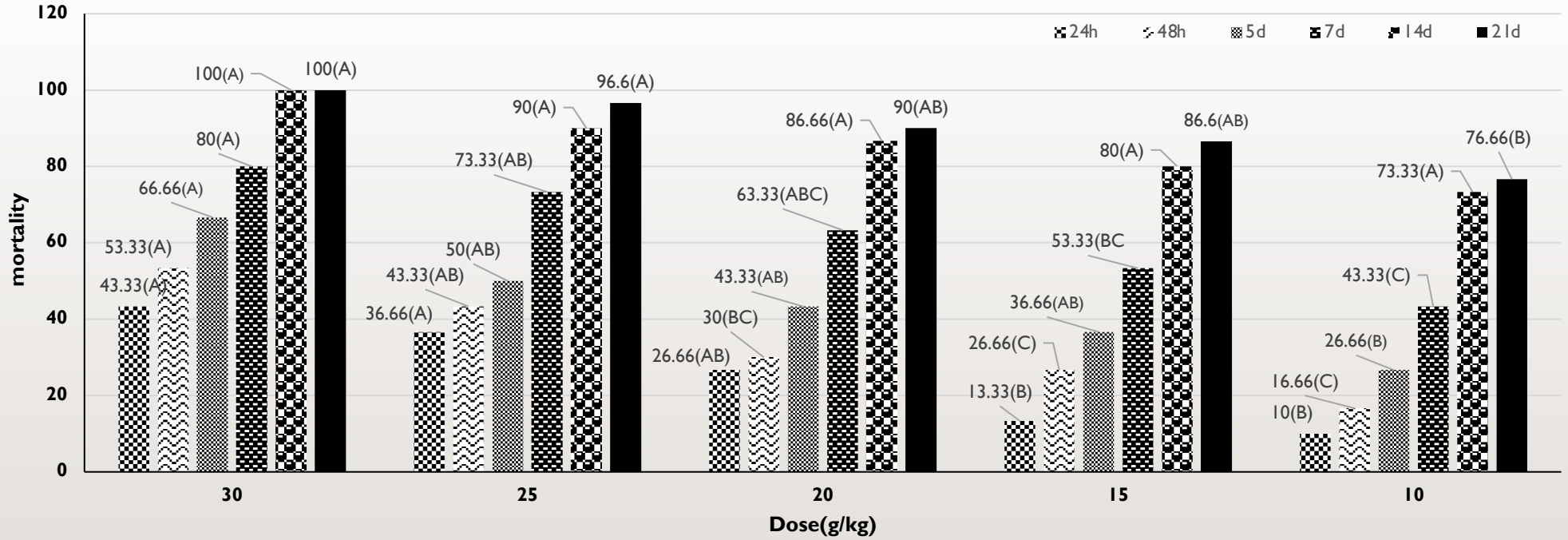
RESULTS:


larval mortality %
100
90
80
70
60
50
40
30
20
10
0
24H
48H
5D
7D
14D
21D
90(A)
80(A)
63.33(A)
50(A)
33.33(A)
23.33(A)
86.66(AB)
73.33(A)
46.66(AB)
43.33(A)
30(A)
16.66(AB)
60(BC)
(B)
30(BC)
23.33(B)
10(B)
6.66(BC)
46.66(CD)
23.33(BC)
16.66(CD)
13.33(BC)
3.33(BC)
0
33.33(CD)
16.66(C)
6.66(D)
6.66(BC)
0 0
30(D)
10(C)
3.33(C)
3.33(D)
0 0
20
10
5
2.5
1.25
0.75
concentration(ppm)

MORTALITY EFFECT ON 4TH INSTAR LARVAE OF *T. CASTANEUM* AGAINST METHOXYFENOZIDE.



MORTALITY EFFECT ON 4TH INSTAR LARVAE OF *T. CASTANEUM* AGAINST KAOLIN CLAY



LC_{50} OF KAOLIN CLAY AGAINST 4^{TH} INSTAR LARVAE OF *T. CASTANEUM*

Time	LC_{50}	Fiducial limit	Equation	Chi-sq.
24h	34.559±2.60	29.548-45.059	1.135X-4.024	1.88
48h	29.783±1.53	25.532-38.7052	0.928X-3.151	2.12
5d	21.898±3.47	90.231-25.912	0.866X-2.67	3.33
7d	12.052±2.59	9.062-14.203	0.823X-2.04	1.64
14d	6.207±3.60	3.608-8.171	1.949X-1.067	8.12
21d	6.054±1.82	3.686-7.837	1.267X-2.28	5.41

LC_{50} OF PYRIPROXYFEN AGAINST 4TH INSTAR LARVAE OF *T. CASTANEUM*

Time	LC_{50}	Fiducial limit	equation	Chi-sq.
24h	-	-	-	-
48h	-	-	-	-
5d	392.268±0.32	78.832-259490889	0.573X-3.426	0.56
7d	363.551±0.64	90.634-57752.8	0.495X-2.920	0.62
14d	307.535±0.96	90.460-8155.98	0.436X-2.500	0.59
21d	245.072±1.51	80.862-3335.06	0.399X-2.198	1.74

DISCUSSION:

- Pyriproxyfen results showed that it is not effective in the mortality of *T. castaneum* but it increases the life span of larvae due to which they fail to pupate and converted into super giant larvae.
- Our results are in lined with who studied Biological activity of two juvenoids and two ecdysteroids against three stored product insects and reported the same results.
- Our results are in agreement with Arthur who reported that the application of Hydroprene against *T. confusum* and *T. castaneum* can results greater that 75% reduction in population development. Methoxyfenozide have also significant effect on the larvae of *t. castaneum* as well as against adults. Our results of Methoxyfenozide are in lined with performed an experiment on Biological Activity of Insect Growth Regulators, Pyriproxyfen, Lufenuron and Methoxyfenozide against *T. castaneum* (Herbst).

- In larvicidal bioassay it is evident from the results that Lufenuron showed maximum mortality followed by Methoxyfenozide and Pyriproxyfen.
- The application of Lufenuron resulted 90% mortality at 20ppm followed by 86.6% at 10ppm dose rate.
- Minimum mortality was observed at 0.75ppm which was 30%. In case of Methoxyfenozide, maximum mortality
- was observed at 20ppm which was 56.6% followed by 30% at 10ppm, 20% at 5ppm, 13.3% at 2.5ppm, 10 % at 1.25ppm and minimum mortality 6.66% was occurred at 0.75ppm.
- Similarly, Pyriproxyfen depicted highest mortality 13.3% at 20ppm followed by 10% at 10ppm and 6.6% at 5ppm. No mortality was occurred at 2.5, 1.25 and 0.75ppm. Results also shows that efficacy of IGR's increased with the passage of time.

Thanks