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Insecticidal activity of substituted hydrazones

Sanjeev kumar Giri
Department of Pharmaceutical chemistry, Akkamahadevei Women`s University, Vijayapura, Karnataka, India

Abstract
Northern Karnataka region especially the Gulbarga District is known for pigeon pea cultivation. One of the major threat to this crop cultivation is a pod borer insect *helicoverpa armigera*. Presently formers are using pesticides of high cost to control the pest this has led to the heavy loss to the formers inn cultivating the crop. It has been reported that some indole derivatives possess insecticidal property. The present work involves insecticidal property of hydrazones which are obtained as intermediates in the process of Fischer Indole synthesis. These freshly prepared hydrazones were tested against *H. armigera* using contact poisoning and stomach poisoning method and results are presented in the form of table.

Keywords: insecticidal, *helicoverpa armigera*, hydrazones

1. Introduction
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The cost of production of insecticide is also an important factor. If the production cost is more than the price of such product will be high but the Economical conditions of our farmers is not good at the same time synthesis of hydrazones is a single step reaction this may decrease the cost of production. This is also one of the reason for the present work being restricted to hydrazones only.

Insecticidal Activity
Insecticides are those substances which kill insects by their chemical action. There may be three classes of them *viz*…
a. Stomach poisons.
b. Contact poisons
c. Fumigants.

Fumigants or poison gases are generally the most effective insecticides to use when the insects and the product they are damaging are in a tight enclosure such as house, store room or green house. Sometimes fumigants are used to destroy insects in their burrows in the soil or in wood and sometimes portable enclosure. Generally when plants, animals or products in the open are to be treated sprays or dusts are applied. These sprays fundamentally act in two types *viz*… stomach poisons and contact poisons.
Another way of classifying insecticides is by their chemical nature
a. Inorganic compounds.
b. Synthetic organic compounds.
c. Organic compounds of plant origin.

In general the inorganic insecticides are effective only as stomach poisons and insecticides of plant origin are effective only as contact poisons. Most of the synthetic organic insecticides may act as contact and stomach poisons and in certain cases as fumigants.
1. Stomach Poison:
Insecticides of this class are generally applied against chewing insects but may also be used for insects with sponging, siphoning, lapping or sucking mouth parts under certain conditions. There are four principle ways of using stomach poisons.
a. The natural food of the insect e.g. the foliage of plants or the feathers of birds is covered with the poison so thoroughly that the insect cannot feed without getting some of the poison
b. The poison is mixed with a substance (an attractant) that is very attractive or tasty to the insect- if possible, more attractive than its normal food and poison-bait mixture is placed where the insect can easily find it.
c. Certain poisons may be sprinkled over the runways of insects so that they get it upon their feet or antennae. While cleaning their appendages with their mouth parts some of the poison will be swallowed, especially if it is a substance irritating to the feet or antennae.
d. Systemic insecticides which are readily absorbed and distributed throughout living organisms, may be used to poison the tissues of plants and animals so that insects feeding there on are killed.

2. Contact Poison
In order to kill an insect with stomach poison, the insect must swallow the poison. Insects with piercing mouth parts take their food from beneath the surface and consequently get none of the poisons applied to the surface of foliage or fruits. Consequently for the piercing-sucking plants we must use a contact poison.
Insecticides of this class kill insects by contacting and entering their bodies directly through the integument into the blood or by penetrating the respiratory system through spiracles into tracheae. These materials may be applied directly to the insect body in a spray or dust or as a residue on plant surfaces, animal`s habitations or other places frequented by insects. There are many types of contact poisons with varying properties and the manner of use depends upon their stability upon exposure to light, moisture and air. Based on their toxicity to plants and animals, their appearances, taste and odor contact poisons may be classified as
a. Plant poisons such as nicotine, anabasine, rotenone, pyrethrum, sabadilla and ryania

b. Synthetic organic compounds such as DDT, BHC, taxophene, chloradane and many indole derivatives.
c. Oils and soaps.
d. Inorganic materials such as Sulphur, lime sulphur, to a limited extent sodium fluoride and arsenic trioxide.

Materials and Method

1. Stomach Poison

The compounds were weighed accurately about 50 mg dissolved in minimum quantity of acetone in a beaker and 4-5 drops of Tween-80 was added which acts as an emulsifying agent. This mixture is then diluted with sterile water to100 ml in a volumetric flask to get a test solution of 500 ppm. The test solution is sprayed on Redgram pods by using a micro sprayer. On the other hand 20 larvae of *H. armigera* were taken and placed in each compartment of feeding tray. The sprayed pods were then place in the compartment to feed the larvae. Observation is made after every 24 hours and results are given in the table no.1

2. Contact Poison

Test solution of 500 ppm as prepared above is taken for contact poison as well and sprayed directly on the larvae using atomizer. The larvae of *H. armigera* which are now treated with test solutions were placed one in each compartment of the tray which were half filled by diet. Percentage mortality of larvae was recorded after 24, 48 and 72 hours and are shown in the table no-2.

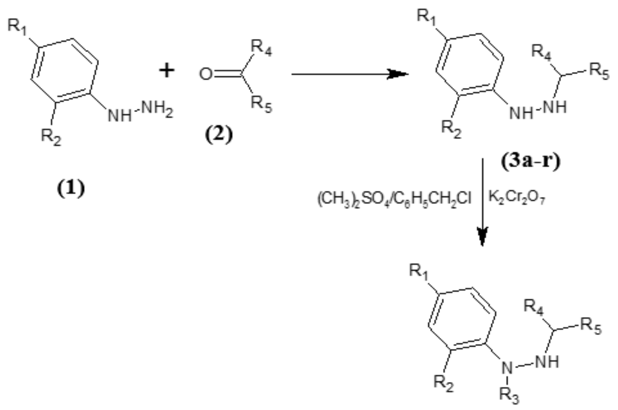
3. Untreated Check

The *H. armigera* larvae were taken and kept one in each compartment of feeding tray. Redgram pods were placed in these compartments to feed without any treatment. Neither the larvae nor the feed is treated with test solution in this group. Observation is made after every 24 Hours to check the mortality.

Results

From the table No-1 it is evident that the compound 4n, 4o showed 53, 25 and 30 percentage of mortality respectively in stomach poison toxicity. All other compounds showed less mortality rate. In case of contact poison toxicity which is summarized in table No-2 shows that the compounds 4a, 4b, 4e, 4g, 4i, 4l, 4m, 4o and 4q showed some good activity especially the compounds 4e, 4m and 4o showed high percentage of mortality.

Scheme of Hydrazones prepared



(4a-r)

Table of compounds

Sl. No	Compound No	R_1	R_2	R_3	R_4	R_5
01	4a	$-NO_2$	$-NO_2$	-H	$-CH_3$	$-CH_3$
02	4b	$-NO_2$	$-NO_2$	-H	$-CH_3$	$-C_6H_5$
03	4c	$-NO_2$	$-NO_2$	-H	$-CH_3$	C_2H_5
04	4d	$-NO_2$	$-NO_2$	-H	C_2H_5	C_2H_5
05	4e	$-NO_2$	$-NO_2$	-H	-H	$-C_6H_5$
06	4f	$-NO_2$	$-NO_2$	-H	-H	$-C_6H_4$(O)-OH
07	4g	$-NO_2$	$-NO_2$	-H	-H	$-C_6H_4$(P)-OCH_3
08	4h	-	-	-H	-H	$-C_6H_5$
09	4i	-	-	-H	-H	$-C_6H_4$(O)-OH
10	4j	-	-	-H	-H	$-C_6H_4$(P)-OCH_3
11	4k	$-NO_2$	$-NO_2$	$-CH_3$	-H	$-C_6H_5$
12	4l	$-NO_2$	$-NO_2$	$-CH_3$	$-CH_3$	$-CH_3$
13	4m	$-NO_2$	$-NO_2$	$-CH_3$	$-CH_3$	$-C_6H_5$
14	4n	$-NO_2$	$-NO_2$	$-CH_2C_6H_5$	$-CH_3$	$-CH_3$
15	4o	$-NO_2$	$-NO_2$	$-CH_3$	-H	$-C_6H_4$(P)-OCH_3
16	4p	$-NO_2$	$-NO_2$	$-CH_3$	$-CH_3$	$-C_2H_5$
17	4q	$-NO_2$	$-NO_2$	$-CH_3$	-H	$-C_6H_4$(O)-OH
18	4r	$-NO_2$	$-NO_2$	$-CH_3$	$-C_2H_5$	$-C_2H_5$

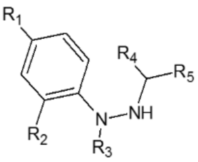


Table 1: Stomach Poisoning Toxicity (Total No of Larvae Used 20)

Sl. No	Compound No	Substitutions					Conc.	No. of Larvae Dead			% Mortality
		R_1	R_2	R_3	R_4	R_5	ppm	24 h	48 H	72H	
01	4a	$-NO_2$	$-NO_2$	-H	$-CH_3$	$-CH_3$	500	5	-	2	35
02	4b	$-NO_2$	$-NO_2$	-H	$-CH_3$	$-C_6H_5$	500	-	3	1	20
03	4c	$-NO_2$	$-NO_2$	-H	$-CH_3$	C_2H_5	500	-	-	1	05
04	4d	$-NO_2$	$-NO_2$	-H	C_2H_5	C_2H_5	500	2	-	-	10
05	4e	$-NO_2$	$-NO_2$	-H	-H	$-C_6H_5$	500	-	1	2	15
06	4f	$-NO_2$	$-NO_2$	-H	-H	$-C_6H_4$(O)-OH	500	-	-	2	10
07	4g	$-NO_2$	$-NO_2$	-H	-H	$-C_6H_4$(P)-OCH_3	500	-	2	1	15
08	4h	-	-	-H	-H	$-C_6H_5$	500	-	3	-	15
09	4i	-	-	-H	-H	$-C_6H_4$(O)-OH	500	-	2	2	20
10	4j	-	-	-H	-H	$-C_6H_4$(P)-OCH_3	500	-	-	4	20
11	4k	$-NO_2$	$-NO_2$	$-CH_3$	-H	$-C_6H_5$	500	-	3	1	20
12	4l	$-NO_2$	$-NO_2$	$-CH_3$	$-CH_3$	$-CH_3$	500	-	1	1	10
13	4m	$-NO_2$	$-NO_2$	$-CH_3$	$-CH_3$	$-C_6H_5$	500	1	2	1	20
14	4n	$-NO_2$	$-NO_2$	$-CH_2C_6H_5$	$-CH_3$	$-CH_3$	500	1	2	2	25
15	4o	$-NO_2$	$-NO_2$	$-CH_3$	-H	$-C_6H_4$(P)-OCH_3	500	5	1	-	30
16	4p	$-NO_2$	$-NO_2$	$-CH_3$	$-CH_3$	$-C_2H_5$	500	1	1	2	20
17	4q	$-NO_2$	$-NO_2$	$-CH_3$	-H	$-C_6H_4$(O)-OH	500	-	2	1	15

18	4r	$-NO_2$	$-NO_2$	$-CH_3$	$-C_2H_5$	$-C_2H_5$	500	2	1	1	20
Untreated Check							-	-	-	1	05

$$\% \text{ Mortality} = \frac{\text{No of Larvae Dead}}{\text{Total No of Larvae used}} \times 100$$

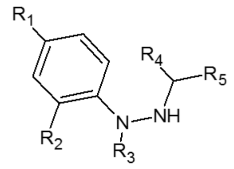


Table 2: Contact Poisoning Toxicity (Total No of Larvae Used 20)

Sl. No	Compound No	Substitutions					Conc.	No. of Larvae Dead			% Mortality
		R_1	R_2	R_3	R_4	R_5	ppm	24 h	48 H	72H	
01	4a	$-NO_2$	$-NO_2$	-H	$-CH_3$	$-CH_3$	500	6	1	-	35
02	4b	$-NO_2$	$-NO_2$	-H	$-CH_3$	$-C_6H_5$	500	2	4	1	35
03	4c	$-NO_2$	$-NO_2$	-H	$-CH_3$	C_2H_5	500	1	1	4	30
04	4d	$-NO_2$	$-NO_2$	-H	C_2H_5	C_2H_5	500	4	1	-	25
05	4e	$-NO_2$	$-NO_2$	-H	-H	$-C_6H_5$	500	6	1	1	40
06	4f	$-NO_2$	$-NO_2$	-H	-H	$-C_6H_4(O)-OH$	500	3	-	1	20
07	4g	$-NO_2$	$-NO_2$	-H	-H	$-C_6H_4(P)-OCH_3$	500	4	1	2	35
08	4h	-	-	-H	-H	$-C_6H_5$	500	2	1	-	13
09	4i	-	-	-H	-H	$-C_6H_4(O)-OH$	500	5	2	-	35
10	4j	-	-	-H	-H	$-C_6H_4(P)-OCH_3$	500	2	1	1	20
11	4k	$-NO_2$	$-NO_2$	$-CH_3$	-H	$-C_6H_5$	500	3	2	2	35
12	4l	$-NO_2$	$-NO_2$	$-CH_3$	$-CH_3$	$-CH_3$	500	2	3	2	35
13	4m	$-NO_2$	$-NO_2$	$-CH_3$	$-CH_3$	$-C_6H_5$	500	5	3	1	45
14	4n	$-NO_2$	$-NO_2$	$-CH_2C_6H_5$	$-CH_3$	$-CH_3$	500	4	-	2	30
15	4o	$-NO_2$	$-NO_2$	$-CH_3$	-H	$-C_6H_4(P)-OCH_3$	500	6	1	2	45
16	4p	$-NO_2$	$-NO_2$	$-CH_3$	$-CH_3$	$-C_2H_5$	500	3	1	-	20
17	4q	$-NO_2$	$-NO_2$	$-CH_3$	-H	$-C_6H_4(O)-OH$	500	4	2	1	35
18	4r	$-NO_2$	$-NO_2$	$-CH_3$	$-C_2H_5$	$-C_2H_5$	500	2	2	1	25
Untreated Check							-	-	1	1	10

$$\% \text{ Mortality} = \frac{\text{No of Larvae Dead}}{\text{Total No of Larvae used}} \times 100$$

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