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Bio-efficacy of cyazypyr 10% OD, a new anthranilic diamide insecticide, against *Epilachna vigintioctopunctata* Fabricius of brinjal

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Abstract
The experiment was conducted during the 2011 and 2012 in the University farm at Kalyani, West Bengal state of India. Brinjal 'Muktakeshi' was grown in plots measuring 5 m×5 m, at spacing of 1m x 0.75m with three replications during the period from mid- April to July, two year, following recommended package of practices. The plots were set out in a randomized block design with eight treatments including an untreated check. Four doses of cyazypyr 10% OD (60, 75, 90 and 105g a.i./ha in both year 2011 and 2012) were sprayed every year for their efficacy along with fipronil 5% SC @ 60 g a.i./ha, Flubendiamide 40% SC @ 30g a.i./ ha and Profenofos 50% SC @ 500 g a.i./ ha as standard check against *E. vigintioctopunctata*. This experiment revealed that all these treatments were significantly superior over untreated control. The most effective treatment was cyazypyr 10% OD @ 105g a.i./ha followed by cyazypyr 10% OD @ 90g a.i./ha.

Keywords: Brinjal**,** cyazypyr, *E. vigintioctopunctata*

Introduction
Brinjal (*Solanum melongena* L.) is one of the widely used vegetable crops by most of the people and is popular in many countries *viz.*, Central, South and South East Asia, some parts of Africa and Central America [1]. It is native of India and second largest brinjal producing country after China with 27.1% share. It is an important vegetable grown in all the seasons. Due to its nutritive value, consisting of minerals like iron, phosphorous, calcium and vitamins like A, B and C, unripe fruits are used primarily as vegetable in the country. Hence, it is subjected to attack by a number of insect pests right from the nursery stage till harvesting [6]. Among the insect pests infesting brinjal, the major ones are epilachna beetle, *Epilachna vigintioctopunctata* (Fab.), shoot and fruit borer, *Leucinodes orbonalis* (Guen.), whitefly, *Bemicia tabaci* (Genn.), leafhopper, *Amrasca biguttula biguttula* (Ishida), and non insect pest, red spider mite, *Tetranychus macfurlanei*.
The main constraint in cultivation of brinjal is the occurrence of pests and diseases. Among the different major insect pests infesting brinjal, epilachna beetle (*Epilachna vigintioctopunctata* Fab.) is very important causing considerable yield loss under West Bengal condition. Epilachna beetle is a key pest of solanaceous and cucurbitaceous crops [2] especially to attack the leaves and feed on the chlorophillous green portion and thereby preventing the photosynthesis by the host plants due to lack of sufficient chlorophyll. Among the different management practices, chemical control is commonly practiced by the farmers for management of insect pest on brinjal and the vegetables. The use of insecticides could be more effective depending on selection of chemicals, doses, method and time of application. Hence, keeping the above point in view, present investigation was carried to evaluate the bio-efficacy of cyazypyr 10% OD on epilachna beetle under field condition.

Materials and Methods
The experiment was conducted during the 2011 and 2012 in the University farm at Kalyani, West Bengal state of India. Brinjal 'Muktakeshi' was grown in plots measuring 5 m×5 m, at spacing of 1m x 0.75m with three replications during the period from mid-April to July, two years, following recommended package of practices. The plots were set out in a randomized block design with eight treatments including an untreated check. Four doses of cyazypyr 10% OD (60, 75, 90 and 105g a.i./ha in both year 2011 and 2012) were sprayed every year for their

efficacy along with fipronil 5% SC @ 60 g a.i./ha, Flubendiamide 40% SC @ 30g a.i./ ha and Profenofos 50% SC @ 500 g a.i./ ha as standard check. Cyazypyr 10% OD @ 180 and 360 g a.i./ha were tested for their effect on crop health. The crop was sprayed 5 times with the insecticides using 500 liters of water / ha at an interval of 10 days starting from 30 days after planting. Control plots were treated with equal amount of water only. Data on per cent shoot damage by shoot and fruit borer was recorded from 5 row only selected fixed plants / plot before and 10 days after each spraying. Number of epilachna beetles (adults and grubs) was recorded from 5 leaves / plant before and 3, 7 and 10 days after each spraying.

Results and Discussion

The population of *E. vigintioctopunctata* grubs and adults recorded / 5 leaves before and 3, 7 and 10 days after each spray in two different seasons are presented in Table 1 and 2**.** The data clearly show that, cyazypyr 10% OD @ 105 and 90g a.i / ha harboured (0.00 - 3.50, 0.00 - 1.67 and 0.00 - 2.80, 0.00 - 2.33 adults and larvae / 5 leaves, respectively in 2011 and 2012) lowest post-treatment population of the insect in most of the observations. These two treatments, however, were often on par with fipronil 5% SC @ 60g a.i. / ha (0.33 - 4.00 and 0.00 – 2.93) profenofos 50% EC @ 500g a.i. / ha (0.00 – 4.80 and 0.67 – 2.80) and cyazypyr 10% OD @ 75g a.i / ha (0.00 - 5.0 and 0.00 - 2.70). Flubendiamide 40% SC @ 30g a.i. / ha (1.0 – 6.87 and 0.67 – 4.47 adults and larvae / 5 leaves, respectively in 2011 and 2012) was the least effective treatment in controlling this pest which was often on a par with cyazypyr 10% OD @ 60g a.i / ha (0.00 – 7.00 and 0.58 – 2.93 adults and larvae / 5 leaves, respectively in 2011 and 2012).

In the season 2012, cyazypyr 10% OD @ 105 and 90g a.i. / ha were statistically on a par in respect of *E. vigintioctopunctata* (Hbst.) population (0.00 - 0.85 and 0.00 - 1.00 adults and larvae / 5 leaves, respectively). Cyazypyr 10% OD @ 90g a.i. / ha (0.00 – 1.00 adults and larvae / 5 leaves), however showed similar performance with fipronil 5% SC @ 60g ai / ha after 7 days of spray (0.86 adults and larvae / 5 leaves, respectively). Cyazypyr 10% OD @ 75g a.i. / ha was on a par fipronil 5% SC @ 60g ai/ha (0.59 - 1.09 adults and grubs / 5 leaves) and profenofos 50% EC @ 500g a.i. / ha (0.73 - 1.95 adults and larvae / 5 leaves) up to 7 days of spray and with its after 3 days of spray. Cyazypyr 10% OD @ 60g a.i. / ha (0.68 - 1.99 adults and larvae / 5 leaves) was on a par with profenofos 50% EC @ 500g a.i. / ha (0.00 - 1.95 adults and larvae / 5 leaves) up to 10 days of spray and fipronil 5% SC @ 60g ai / ha (0.57 - 0.86 adults and larvae / 5 leaves) after 3 and 10 days of spray. Flubendiamide 40% SC @ 30g a.i. / ha harboured 1.37 - 4.03 adults and larvae of *E. vigintioctopunctata* / 5 leaves and was inferior to other insecticidal treatments.

Average values of post - treatment population of *E. vigintioctopunctata* adult and larvae obtained in 2011 show that, cyazypyr 10% OD @ 105g a.i. / ha harboured lowest population of this pest (0.39 - 1.40 / 5 leaves). Cyazypyr 10% OD @ 90g a.i. / ha harboured 0.44 - 1.56 adults and larvae / 5 leaves and this treatment showed similar performance with cyazypyr 10% OD @ 105g a.i. / ha. Fipronil 5% SC @ 60g a.i. / ha was next to cyazypyr 10% OD @ 105 and 90g a.i. / ha.

After 3 and 10 days of spray, cyazypyr 10% OD @ 75g a.i. / ha (1.07 - 2.87 adults and larvae / 5 leaves) showed similar performance with profenofos 50% EC @ 500g a.i. / ha (0.97 - 1.51 adults and larvae / 5 leaves). It showed similar performance with fipronil 5% SC @ 60g ai / ha up to 7 days of treatment (1.17 - 1.81 adults and larvae / 5 leaves). Cyazypyr 10% OD @ 60g a.i. / ha (1.37 adults and larvae / 5 leaves) was found to be statistically similar to its 75g a.i. / ha (1.07 adults and larvae / 5 leaves) up to 7 days after spray, and with fipronil 5% SC @ 60g a.i. / ha (1.17 adults and larvae / 5 leaves) up to 3 days of treatments (Table 3).

[5] revealed that After the 3rd and 7th day of spray, cyantraniliprole at105 g a.i./ha found significantly more effective in controlling thrips and it was at par with cyantraniliprole at 90 g a.i./ha. According to [4], both the doses of cyantraniliprole i.e. 105 and 90 g a.i./ha were found equally effective against *T. tabaci* infesting tomato. [3] reported that cyantraniliprole at 90 and 105 g a.i.ha-1 was more effective in reducing the pest population in tomato.

Table 1: Number of *E. vigintioctopunctata* (grubs and adults) / 5 leaves in different treatment (2011)

TREATMENTS	1st spray			2nd spray			3rd spray			4th spray			5th spray			
	PT	3DAS	7DAS	PT	3DAS	7DAS	PT	3DAS	7DAS	PT	3DAS	7DAS	PT	3DAS	7DAS	10DAS
Cyazypyr 10% OD @ 60 ga.i./ha	6.40 (2.47)	0.84 (0.91)	4.93 (2.22)	7.00 (2.65)	1.91 (1.36)	4.53 (2.12)	6.27 (2.50)	1.91 (1.35)	2.00 (1.41)	4.27 (2.06)	1.43 (1.39)	2.27 (1.51)	3.10 (1.76)	1.09 (1.27)	0.73 (1.10)	0.00 (0.71)
Cyazypyr 10% OD @ 75ga.i./ha	9.33 (3.05)	1.07 (1.03)	3.93 (1.97)	5.00 (2.23)	1.87 (1.34)	3.80 (1.93)	4.20 (2.05)	1.13 (1.06)	1.87 (1.32)	3.43 (1.85)	1.07 (1.25)	1.67 (1.27)	1.73 (1.31)	0.13 (0.79)	0.20 (0.83)	0.00 (0.71)
Cyazypyr 10% OD @ 90ga.i./ha	10.47 (3.21)	0.73 (0.83)	2.27 (1.48)	3.27 (1.81)	0.40 (0.63)	2.47 (1.56)	2.80 (1.67)	1.00 (1.00)	0.73 (0.81)	1.25 (1.12)	0.00 (0.71)	0.33 (0.57)	0.47 (0.67)	0.07 (0.75)	0.00 (0.71)	0.00 (0.71)
Cyazypyr 10% OD @ 105ga.i./ha	7.93 (2.81)	0.67 (0.81)	1.27 (1.12)	3.37 (1.83)	0.27 (0.51)	1.20 (1.08)	3.50 (1.86)	1.00 (1.00)	0.40 (0.62)	0.80 (0.89)	0.00 (0.71)	0.20 (0.45)	0.33 (0.57)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)
Profenofos 50% EC @ 500g a.i./ha	8.73 (2.85)	0.80 (0.87)	1.80 (2.32)	4.80 (2.19)	1.73 (1.29)	3.33 (1.81)	4.40 (2.10)	1.60 (1.21)	2.00 (1.41)	3.27 (1.80)	0.73 (1.11)	1.00 (1.00)	2.93 (1.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)
Fipronil 5% SC @ 60g a.i./ ha	6.73 (2.49)	1.13 (1.06)	2.40 (1.55)	4.00 (2.00)	1.93 (1.37)	3.47 (1.85)	3.60 (1.90)	1.73 (1.31)	1.73 (1.29)	1.80 (1.34)	0.80 (1.14)	1.20 (1.09)	1.70 (1.30)	0.20 (0.83)	0.27 (0.87)	0.33 (0.91)
Flubendiamide40% SC @ 30g a.i /ha	6.33 (2.52)	1.83 (1.35)	5.20 (2.27)	9.20 (3.03)	2.76 (1.66)	5.13 (2.24)	6.87 (2.62)	2.49 (1.57)	3.40 (1.83)	4.60 (2.14)	1.51 (1.42)	3.07 (1.75)	4.25 (2.06)	1.13 (1.27)	1.00 (1.22)	1.30 (1.34)
Untreated Control	6.73 (2.51)	8.07 (2.81)	11.07 (3.32)	13.07 (3.60)	15.73 (3.96)	9.40 (3.06)	9.60 (3.10)	8.53 (2.91)	5.80 (2.32)	9.27 (3.02)	7.67 (2.85)	7.13 (2.66)	9.20 (3.03)	5.07 (2.35)	2.80 (1.81)	5.40 (2.43)
CD (p=0.05)	NS	0.35	0.51	0.28	0.42	0.47	0.22	0.47	0.74	0.30	0.18	0.28	0.21	0.23	0.17	0.07

*Values within parentheses are square root transformed

Table 2: Number of *E. vigintioctopunctata* (grubs and adults) / 5 leaves in different treatment (2012)

Treatments	1st spray			2nd spray			3rd spray			4th spray			5th spray			
	PT	3DAS	7DAS	PT	3DAS	7DAS	PT	3DAS	7DAS	PT	3DAS	7DAS	PT	3DAS	7DAS	10DAS
Cyazypyr 10% OD @ 60 ga.i./ha	-	-	0.40 (0.94)	1.33 (1.34)	0.53 (0.73)	1.26 (1.32)	3.27 (1.80)	1.22 (1.31)	2.20 (1.47)	2.93 (1.71)	0.95 (1.20)	1.86 (1.35)	1.40 (1.18)	0.58 (1.02)	1.46 (1.40)	1.00 (1.22)
Cyazypyr 10% OD @ 75ga.i./ha	-	-	0.00 (0.71)	0.33 (0.88)	0.27 (0.85)	0.33 (0.91)	2.05 (1.43)	1.18 (1.29)	2.30 (1.44)	2.70 (1.64)	1.11 (1.27)	2.03 (1.41)	2.20 (1.48)	0.58 (1.02)	0.76 (1.11)	0.33 (0.91)
Cyazypyr 10% OD @ 90ga.i./ha	-	-	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.67 (1.05)	1.00 (1.00)	0.00 (0.71)	1.33 (1.14)	1.67 (1.29)	0.00 (0.71)	1.40 (1.17)	2.33 (1.49)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)
Cyazypyr 10% OD @ 105ga.i./ha	-	-	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.33 (0.91)	1.00 (1.00)	0.00 (0.71)	1.33 (1.14)	1.60 (1.25)	0.00 (0.71)	0.80 (0.89)	1.67 (1.28)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)
Profenofos 50% EC @ 500g a.i./ha	-	-	1.00 (1.22)	1.00 (1.22)	0.67 (1.05)	1.33 (1.34)	2.80 (1.67)	1.07 (1.25)	1.00 (1.00)	2.33 (1.47)	1.07 (1.25)	1.67 (1.28)	2.60 (1.56)	0.87 (1.14)	1.07 (1.25)	1.00 (1.22)
Fipronil 5% SC @ 60g a.i./ ha	-	-	0.00 (0.71)	0.33 (0.88)	0.27 (0.85)	1.00 (1.22)	2.27 (1.50)	1.00 (1.22)	1.00 (1.00)	2.67 (1.58)	0.80 (1.14)	1.33 (1.15)	2.93 (1.71)	0.80 (1.13)	0.93 (1.20)	1.00 (1.22)
Flubendiamide 40% SC @ 30g a.i /ha	-	-	1.97 (1.57)	3.93 (2.10)	0.67 (1.05)	2.31 (1.67)	4.33 (2.08)	1.52 (1.42)	3.31 (1.82)	4.47 (2.11)	1.00 (1.22)	3.37 (1.83)	4.33 (2.08)	1.59 (1.44)	2.71 (1.79)	3.07 (1.89)
Untreated Control	-	-	1.67 (1.46)	1.73 (1.49)	2.80 (1.81)	3.87 (2.09)	7.20 (2.68)	8.07 (2.93)	8.93 (2.99)	8.33 (2.86)	8.67 (3.02)	8.73 (2.95)	8.27 (2.87)	8.07 (2.93)	7.67 (2.85)	2.47 (1.72)
CD (p=0.05)			0.51	0.41	0.41	0.52	0.19	0.23	0.38	0.58	0.22	0.33	0.45	0.36	0.22	0.09

*Values within parentheses are square root transformed

Table 3: Number of E. *vigintioctopunctata* / 5 leaves on different treatment (Average of 5 sprays)

Treatments	2011				2012			
	PT	3DAS	7DAS	10DAS	PT	3DAS	7DAS	10DAS
Cyazypyr 10% OD @ 60 ga.i./ha	6.40 (2.47)	1.37 (1.17)	2.89 (1.70)	4.13 (2.03)	0.00 (0.71)	0.68 (1.09)	1.46 (1.21)	1.99 (1.41)
Cyazypyr 10% OD @ 75ga.i./ha	9.33 (3.05)	1.07 (1.03)	2.30 (1.52)	2.87 (1.69)	0.00 (0.71)	0.59 (1.04)	1.09 (1.04)	1.52 (1.23)
Cyazypyr 10% OD @ 90ga.i./ha	10.47 (3.21)	0.44 (0.66)	1.17 (1.08)	1.56 (1.25)	0.00 (0.71)	0.00 (0.71)	0.68 (0.82)	1.00 (1.00)
Cyazypyr 10% OD @ 105ga.i./ha	7.93 (2.81)	0.39 (0.63)	0.61 (0.77)	1.40 (1.18)	0.00 (0.71)	0.00 (0.71)	0.50 (0.70)	0.85 (0.92)
Profenofos 50% EC @ 500ga.i./ha	8.73 (2.85)	0.97 (0.98)	1.51 (1.23)	3.07 (1.75)	0.00 (0.71)	0.73 (1.11)	1.21 (1.10)	1.95 (1.39)
Fipronil 5% SC @60g a.i./ ha	6.73 (2.49)	1.17 (1.08)	1.81 (1.34)	2.28 (1.51)	0.00 (0.71)	0.57 (1.03)	0.86 (0.93)	1.84 (1.36)
Flubendiamide40% SC @ 30g a.i /ha	6.33 (2.52)	1.93 (1.39)	3.57 (1.89)	5.24 (2.29)	0.00 (0.71)	1.37 (1.37)	2.73 (1.65)	4.03 (2.01
Untreated Control	6.73 (2.51)	9.01 (2.99)	7.25 (2.69)	9.31 (3.04)	0.00 (0.71)	6.13 (2.57)	6.17 (2.48)	8.73 (2.59)
CD (p=0.05)	NS	0.18	0.19	0.12	NS	0.11	0.13	0.12

*Values within parentheses are square root transformed

Conclusion

The data clearly show that, cyazypyr 10% OD @ 105 and 90g a.i / ha harboured lowest post-treatment population of the insect in most of the observations. These two treatments, however, were often on par with fipronil 5% SC @ 60g a.i. / ha, profenofos 50% EC @ 500g a.i. / ha, and cyazypyr 10% OD @ 75g a.i / ha. Flubendiamide 40% SC @ 30g a.i. / ha was the least effective treatment in controlling this pest which was often on a par with cyazypyr 10% OD @ 60g a.i / ha.

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