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# Yield Performance of Heat Tolerant Country Bean (*Lablab purpureus* Lin.) as Influenced by Insecticides During Kharif Season

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Field experiment was conducted in the research field of Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur, Bangladesh during 2009 kharif season to evaluate the efficacy of insecticides for increasing yield of country bean by protecting pod damage by bean pod borers. The spray plots gave significantly higher yield than the control plots. Among the insecticides, Neem oil, Fenitrothion50 EC and Emamectin benzoate 5 SG performed best by reducing 59.46, 51.35 & 45.95 % infested pod production respectively. For marketable pod yield, Deltramethrin 2.5 EC, Fenotrothion 50 EC and Curtap 50 SP performed best by producing 5.78, 5.48 & 5.39 ton/hectate at the same time increasing 46.70, 38.58 & 36.80 % marketable pod yield over control respectively. Thus for gross yield, Deltramethrin 2.5 EC, Fenitrothion 50 EC & Cutap 50 SP performed best by producing 6.11, 5.65 & 5.61 ton/ha as well as increasing 41.76, 31.09 & 30.16 % gross pod production. Therefore, Deltramethrin 2.5 EC, Fenitrothion 50 EC & Curtap 50 SP can be recommended for successful country bean cultivation with more production during kharif season.

*Keyword:* Yield performance, Heat tolerant country bean, Insecticides, Marketable yield, Gross yield

## 1. Introduction

Bangladesh is one of the most densely populated countries in the world. With the increase of population, the cropped area is reducing and the total production of crop including vegetables is decreasing. In Bangladesh, the annual production of vegetable is 1.53 million metric tons [1], which is far below to its actual requirement of 9.21 m metric tons. The average vegetable consumption in Bangladesh is only 50 g per head per day, against the actual requirement of 213 gram [2]. There is a big gap between the need and supply of vegetable in the country. As a result, the chronic malnutrition is commonly evident in Bangladesh, which results in poor physical and mental growth, labour inefficiency and short span of working life and poor physical activity.

Country bean, *Lablab purpureus* (Linn.) is reported to be originated in India [3,4] and then spreaded to other parts of the world. It is a common and protein rich leguminous vegetable. In Bangladesh, it is commercially cultivated in Comilla, Noakhali, Sylhet, Dhaka, Kishoregonj, Tangail, Jessore, Pabna and Dinajpur [5]. Noticable development in country bean cultivation as ail crop is stricking the attention of the general people of Chittagong region [6]. Although beans are considered as the major

group of vegetables grown intensively in Rabi season, some varieties of country bean can be grown year round including Kharif. Thus the importance of country bean from growing season point of view is highly significant. Because more than 70% of the vegetables are produced in the Rabi season while less than 30% are grown in Kharif season [7]. Thus the seasonal distribution of vegetable production is highly contagious and supply of fresh vegetables from local production is not available year round. In this context, the country bean having varieties suitable for production during off season can play a vital role to meet up the off season vegetable deficiency.

Inspite of being a prospective crop, high incidence of insect pests have resulted its low yield and poor quality. Yield loss in country bean due to insect pests is reported to be about 12-30 percent [8]. Till now the only way to protect the country bean from its yield loss is by applying insecticides. Therefore, the present study was undertaken to observe the effect of insecticides on yield of heat tolerant country bean grown during kharif season.

## 2. Materials and Methodes

The experiment was conducted at the Research field of Entomology Department of Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur during the period from 9 March to 15 July 2009. The study area is situated at 24.09 N latitude and 90.26 E longitudes with an elevation of 8.4 meter from the sea level. The experiment was laid out in randomized complete block design (RCBD) with three replications. The plot size was 5mx2m keeping plot to plot distance 1m and block to block distance 2 m. The soil was well prepared, and good tilth was ensured for commercial crop production and standard dosages of cow dung and fertilizers were applied as per recommendation [9]. The seedlings of heat tolerant IPSA Seem 2 with good vigor were transplanted in the main field on 23$^{th}$ March 2009. After transplanting a light irrigation was given. Irrigation, fertilization, weeding and mulching in the plots were done whenever necessary.

The treatments comprised of eight insecticides including one botanical (fresh) and (stored) with untreated control. The treatments were: $T_1$ = Cypermethrin (Ripcord) 10 EC @ 1.0 ml / L water, $T_2$ = Fenitrothion (Sumithion) 50 EC @ 1.0 ml / L water, $T_3$ = Fenvalerate (Fenfen) 20 EC @ 1.0 ml / L water, $T_4$ = Emamectin benzoate (Proclaim) 5 SG @ 1.0 g / L water, $T_5$ = Deltramethrin (Decis) 2.5 EC @ 1.0 ml / L water, $T_6$ = Esfenvalerate (Sumialpha) 5 EC @ 1.0 ml / L water, $T_7$ = Curtap (Suntap) 50 SP @ 2.0 g / L water, $T_8$ = Neemoil (fresh) @ 2.5 ml / L water, $T_9$ = Neemoil (stored) @ 2.5 ml / L Water, $T_{10}$ = Untreated control. The fresh Neemoil was collected from Ghani mill located at Kakonhat bazar, Godagari, Chapai Nawabgonj and the Neemoil was stored at room temperature for 16 month. The insecticides and botanicals were sprayed at their recommended rate using knapsack sprayer at 10 days interval from first flowering to before last harvest of country bean. During spray, drifting of insecticides was checked by avoiding heavy wind and appropriate rules of insecticide application. The mature pods were harvested from all plots before spray. During harvest infested pods were separated from the healthy one's and then the number and weight of both healthy and infested pod was recorded. The collected data were properly compiled, coded, tabulated and analyzed statistically using MSTAT- C software. The means were compared for significant difference using the Duncan's Multiple Range Test (DMRT). The two formulae were used for calculating percent increase or reduction over control.

**Percent increase over control**

$$= \frac{\text{Mean value of the tratment} - \text{Mean value of the control}}{\text{Mean value of the control}} \times 100$$

**Percent reduction over control**

$$= \frac{\text{Mean value of the control} - \text{Mean value of the treatment}}{\text{Mean value of the control}} \times 100$$

## 3. Results and Discussion

### 3.1. Effect of Insecticides on Pod Infestation Reduction

The insecticides play significant role in pod yield by reducing pod infestation of country bean as given in Table 01. The lowest amount of infested pod was counted from Fresh Neemoil (36.00/plot) which was followed by Emamectin benzoate 5 SG (46.33/plot), Fenitrothion 50 EC (48.67/plot), Curtap 50 SP (52.67/plot) and Stored Neemoil (61.00/plot) while that of highest was produced in control plot (96.33/plot) followed by Deltramethrin 2.5 EC (82.67/plot), Cypermethrin 10 EC (70.00/plot), Esfenvalerate 5 EC (68.67/plot) and Fenvalerate 20 EC (65.60/plot) (Table 01). Reduction of pod infestation over control found maximum in Fresh Neemoil (62.63 %) which was followed by Emamectin benzoate 5 SG (51.90 %), Fenitrothion 50 EC (49.48 %) and Curtap 50 SP (45.32 %) while that of minimum was in Deltramethrin 2.5 EC (14.18 %) followed by Cypermethrin 10 EC (27.33 %), Esfenvalerate 5 EC (28.71 %) and Fenvalerate 20 EC (31.83 %). Similarly lowest quantity of infested pod was collected from Fresh Neemoil (0.15 ton/ha) which was followed by Fenitrothion 50 EC (0.18 ton/ha), Emamectin benzoate 5 SG (0.20 ton/ha), Curtap 50 SP (0.23 ton/ha) and Esfenvalerate 5 EC (0.24 ton/ha) while the highest of that was found in control (0.37 ton/ha) followed by Deltramethrin 2.5 EC (0.33 ton/ha), Fenvalerate 20 EC (0.31 ton/ha), Cypermethrin 10 EC as well as Stored Neemoil (0.27 ton/ha). Maximum reduction of infested pod quantity over control was confirmed from Fresh Neemoil (59.46 %) followed by Fenitrothion 50 EC (51.35%), Emamectin benzoate 5 SG (45.95 %) and Curtap 50 SP (37.84 %) while Deltramethrin 2.5 EC (10.81 %), Fenvalerate 20 EC (16.22 %), Cypermethrin 10 EC as well as Stored Neemoil (27.03 %) and Esfenvalerate 5 EC (35.14 %) confirmed the minimum reduction over control respectively.

**Table 1:** Effect of insecticides for reducing infested pod production

| Treatments | Number of infested pod/plot | % reduction over control | Wt. of infested pod (ton/ha) | % reduction over control |
|---|---|---|---|---|
| Cypermethrin 10 EC | 70.00 c | 27.33 | 0.27 bcd | 27.03 |
| Fenitrothion 50 EC | 48.67 e | 49.48 | 0.18 ef | 51.35 |
| Fenvalerate 20 EC | 65.60 c | 31.83 | 0.31 abc | 16.22 |
| Emamectin benzoate 5 SG | 46.33 e | 51.90 | 0.20 def | 45.95 |
| Deltrametrin 2.5 EC | 82.67 b | 14.18 | 0.33 ab | 10.81 |
| Esfenvalerate 5 EC | 68.67 c | 28.71 | 0.24 cde | 35.14 |
| Curtap 50 SP | 52.67 de | 45.32 | 0.23 cdef | 37.84 |
| Neemoil (fresh) | 36.00 f | 62.63 | 0.15 f | 59.46 |
| Neemoil (stored) | 61.00 cd | 36.68 | 0.27 bcd | 27.03 |
| Untreated control | 96.33 a | | 0.37 a | |
| CV | 9.20 % | | 15.21% | |

*Values are mean of 3 replications from 6 harvests. In a column, means followed by same letter (s) are statistically identical by DMRT at 5% level of significance.

Among the tested insecticides, Fresh Neem oil @ 2.5 ml/L water followed by Fenitrothion 50 EC@ 1 ml/L water and Emamectin benzoate 5 SG@ 1g/L water performed best for reducing damaged pod over control during kharif season. Similarly, during kharif season maximum reduction of pod damage over control was ensured by Emamectin benzoate 5SG@1g/L water followed by Cypermethrin 10 EC @ 1ml/L water and curtap 50 SP @ 2g/L water [10].

### 3.2. Effect of insecticides on Marketable Pod Production Increase

The highest number of healthy pod production was ensured from Deltramethrin 2.5 EC (1558/plot) treated plots which was followed by Emamectin benzoate 5 SG (1509/plot),

Fenitrothion 50 EC (1497/plot), Curtap 50 SP (1474/plot) and Esfenvalerate 5 EC (1456/plot). Conversely, the lowest number of pod production was obtained from untreated control (1076/plot) plot followed by Neemoil (fresh) (1118/plot), Cypermethrin 10 EC (1156/plot), Neemoil (stored) (1287/plot) and Fenvalerate 20 EC (1349/plot) where the first three were statistically similar. Highest increase of healthy pod over control was achieved from Deltramethrin 2.5 EC (44.80 %) followed by Emamectin benzoate 5 SG (40.24 %), Fenitrothion 50 EC (39.13 %), Curtap 50 SP (36.99 %) and Esfenvalerate 5 EC (35.32 %) while that of lowest was obtained from Neemoil (fresh) (3.90 %), Cypermethrin 10 EC (7.43 %), Neemoil (stored) (19.61 %) and Fenvalerate 20 EC (25.37 %). Highest quantity of marketable yield was obtained from Deltramethrin 2.5 EC (5.78 ton/ha) treated plots which was followed by Fenitrothion 50 EC (5.48 ton/ha), Curtap 50 SP (5.39 ton/ha), Emamectin benzoate 5 SG (5.31 ton/ha) and Esfenvalerate 5 EC (5.29 ton/ha) while the lowest of that was found in untreated control (3.94 ton/ha) followed by Cypermethrin 10 EC (4.06 ton/ha), Neemoil (fresh) (4.17 ton/ha), Neemoil (stored) (4.55 ton/ha) and Fenvalerate 20 EC (4.97 ton/ha). Maximum increase of marketable yield over control was achieved from Deltramethrin 2.5 EC (46.70 %) which was followed by Fenitrothion 50 EC (38.58 %), Curtap 50 SP (36.80 %), Emamectin benzoate 5 SG (34.77 %) and Esfenvalerate 5 EC (34.26 %) while the lowest of that was found from Cypermethrin 10 EC (3.05 %) followed by Neemoil (fresh) (5.84 %), Neemoil (stored) (15.48 %) and Fenvalerate 20EC (26.14%).

**Table 2:** Effect of insecticides for Increasing Marketable Pod Production

| Treatments | Marketable yield (Number/plot) | % increase over control | Marketable yield (ton/ha) | % increase over control |
|---|---|---|---|---|
| Cypermethrin 10 EC | 1156 de | 7.43 | 4.06 d | 3.05 |
| Fenitrothion 50 EC | 1497 ab | 39.13 | 5.48 ab | 38.58 |
| Fenvalerate 20 EC | 1349 bc | 25.37 | 4.97 bc | 26.14 |
| Emamectin benzoate 5 SG | 1509 ab | 40.24 | 5.31 ab | 34.77 |
| Deltrametrin 2.5 EC | 1558 a | 44.80 | 5.78 a | 46.70 |
| Esfenvalerate 5 EC | 1456 ab | 35.32 | 5.29 ab | 34.26 |
| Curtap 50 SP | 1474 ab | 36.99 | 5.39 ab | 36.80 |
| Neemoil (fresh) | 1118 e | 3.90 | 4.17 d | 5.84 |
| Neemoil (stored) | 1287 cd | 19.61 | 4.55 cd | 15.48 |
| Untreated control | 1076 e | | 3.94 d | |
| CV | 6.66 % | | 6.89 % | |

*Values are mean of 3 replications from 6 harvests. In a column, means followed by same letter(s) are statistically identical by DMRT at 5% level of significance.

Among the treated insecticides, Deltrametrin 2.5 EC (5.78 ton/ha & 46.70 %) followed by Fenitrothion 50 EC (5.48 ton/ha & 38.54 %) and Curtap 50 SP (5.39 ton/ha & 36.80 %) performed best by ensuring highest marketable pod production as well as maximum increase of marketable pod over control respectively [10]. observed that Deltramethrin 2.5 EC @ 1ml/L water produced 5.0 ton/ha marketable pod as well as 32.7% yield increase over contron but curtap 50 WP @ 2g/L water produced 3.97 ton/ha marketable yield confirming 28.41 % marketable yield increase over control. It was found that Fenitrothion 50 EC @ 1.5 ml/L water IPSA seem-2 produced 7.42 ton/ha marketable yield during winter season [11, 12] observed that yield of country bean in Deltramethrin 2.5 EC, Esfenvalerate 5 EC and Curtap 50SP treated plot was 4.76, 7.02 & 7.92 kg /plot respectively. In increasing yield, various insecticides such as Curtap, Deltramethrin, Cypermethrin, Emamectin benzoate have been reported to be effective against *M. vitrata* on cowpea [13, 14]. In increasing yield, various insecticides such as Curtap,

Deltramethrin, cypermethrin, Emamectin benzoate have been reported to be effective against *M. vitrata* on urdbean [15] and black gram[16].

### 3.3. Effect of Insecticides on Gross Pod Production

For gross yield, highest number was obtained from Deltramethrin 2.5 EC (1640.67/plot), Emamectin benzoate 5 SG (1555.33/plot), Fenitrothion 50 EC (1545.67/plot), Curtap 50 SP (1526.67/plot) and Esfenvalerate 5 EC (1524.67/plot) while the lowest of that was found from untreated control (1172.33/plot) which was followed by Neemoil (fresh) (1174/plot), Cypermethrin 10 EC (1226/plot), Neemoil (stored) (1348/plot) and Fenvalerate 20 EC (1414.67/plot). Highest increase of total pod over control was achieved from Deltramethrin 2.5 EC (39.95 %) followed by Emamectin benzoate 5 SG (32.67 %), Fenitrothion 50 EC (31.85 %), Curtap 50 SP (30.23 %) and Esfenvalerate 5 EC (30.05%) while the lowest of that was obtained from Neemoil (fresh) (0.14 %) followed by Cypermethrin 10 EC (4.58 %), Neemoil (stored) (14.98 %) and Fenvalerate 20 EC (20.67 %). On the other hand, highest quantity of gross yield was obtained from Deltramethrin 2.5 EC (6.11 ton/ha) followed by Fenitrothion 50 EC (5.65 ton/ha), Curtap 50 SP (5.61 ton/ha), Esfenvalerate 5 EC (5.54 ton/ha) and Emamectin benzoate 5 SG (5.52 ton/ha). Conversely, the lowest of that was obtained from untreated control (4.31 ton/ha) followed by Neemoil (fresh) (4.32 ton/ha), Cypermethrin 10 EC (4.33 ton/ha), Neemoil (stored) (4.82 ton/ha) and Fenvalerate 20 EC (5.27 ton/ha). Yield performance of any insecticides depends on its ability to increase yield over control by reducing pod infestation. Considering this, best performance was achieved from Deltramethrin 2.5 EC (41.76 %) followed by Fenitrothion 50 EC (31.09 %), Curtap 50 SP (30.16 %), Esfenvalerate 5 EC (28.54 %) and Emamectin benzoate 5 SG (28.07 %) while the lowest of that was achieved from Neemoil (fresh) (0.23 %) followed by Cypermethrin 10 EC (0.46 %), Neemoil (stored) (11.83 %) and Fenvalerate 20 EC (23.42 %).

**Table 3:** Effect of insecticides for Increasing Gross Pod Production

| Treatments | Gross yield (Number/plot) | % increase over control | Gross yield (ton/ha) | % increase over control |
|---|---|---|---|---|
| Cypermethrin 10 EC | 1226 de | 4.58 | 4.33 d | 0.46 |
| Fenitrothion 50 EC | 1545.67 ab | 31.85 | 5.65 ab | 31.09 |
| Fenvalerate 20 EC | 1414.67 bc | 20.67 | 5.27 bc | 23.42 |
| Emamectin benzoate 5 SG | 1555.33 ab | 32.67 | 5.52 ab | 28.07 |
| Deltrametrin 2.5 EC | 1640.67 *a* | 39.95 | 6.11 a | 41.76 |
| Esfenvalerate 5 EC | 1524.67 ab | 30.05 | 5.54 ab | 28.54 |
| Curtap 50 SP | 1526.67 ab | 30.23 | 5.61 ab | 30.16 |
| Neemoil (fresh) | 1174 e | 0.14 | 4.32 d | 0.23 |
| Neemoil (stored) | 1348 cd | 14.98 | 4.82 cd | 11.83 |
| Untreated control | 1172.33 e | | 4.31 d | |
| CV | 6.54 % | | 6.54 % | |

Values are mean of 3 replications from 6 harvests. In a column, means followed by same letter(s) are statistically identical by DMRT at 5% level of significance.

The above discussion thus revealed that among the treated insecticides, Deltrametrin 2.5 EC, Fenitrothion 50 EC and Curtap 50 SP performed best by confirming highest gross yield as well as increasing gross yield over control during summer season[17]. observed that IPSA seem 2 produce 4.33 ton/ha during winter under the treatment Carbofuran 5G@ 1.5 kg/ha + Cypermethrin 10 EC @ 1 ml/L water. It was reported that dolichos bean produced on an

average, 5-8 ton per hectare [18, 19] observed country bean produced 8.39 to 11.55 tons per hectare. In increasing yield, various insecticides such as Curtap, Deltramethrin, Cypermethrin, Emamectin benzoate have been reported to be effective against *M. vitrata* on cowpea [13, 14].

## 4. Conclusions

Considering the unavailability of vegetables in kharif season in comparison to winter, the heat tolerant variety of country bean (IPSA Seem 2) provided satisfactory marketable yield of 5.78, 5.48 & 5.39 ton/ha and as well as gross yield of 6.11, 5.65 & 5.61 ton/ha when treated with Deltramethrin 2.5 EC @ 1ml/L water, Fenitrothion 50 EC @ 1ml/L water and Curtap 50 SP @ 2 g/L water respectively. These insecticides can be recommended for successful country bean production as these could control bean pod borer satisfactorily.

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