

## Intercropping Coriander with Chickpea for Pod Borer Insect Suppression

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**Abstract:** A field experiment was conducted at the research field of Agronomy Division, Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur during rabi season of 2014-15 to find out suitable intercrop combination of coriander with chickpea for pod borer insect suppression and economic benefit. There were six treatments in the experiment viz. T<sub>1</sub>=Sole Chickpea (40cm line spacing), T<sub>2</sub>=Sole coriander (broadcast), T<sub>3</sub>=100% Chickpea + 25% coriander (One row coriander between two row chickpea), T<sub>4</sub>=100% Chickpea + 50% coriander (Two row coriander between two row chickpea), T<sub>5</sub>=100% Chickpea + 75% coriander (Three row coriander between two row chickpea), T<sub>6</sub>=100% chickpea + 100% coriander (Broadcast). Maximum pod borer infestation was observed in sole chickpea (13.71%) and infestation was reduced with the increase of coriander population intercrop situation. The minimum (3.65%) pod borer infestation was recorded in T<sub>4</sub> treatment. Chickpea yield and yield components were inversely related to pod borer infestation. The highest chickpea yield (1.40 t ha<sup>-1</sup>) was obtained from treatment T<sub>4</sub> while the lowest (1.03 t ha<sup>-1</sup>) from T<sub>1</sub> treatment. The highest chickpea equivalent yield (1.79 t ha<sup>-1</sup>), gross return (Tk. 1, 25,020 ha<sup>-1</sup>), gross margin (Tk. 36,000 ha<sup>-1</sup>) and benefit cost ratio BCR (1.41) were obtained from treatment T<sub>4</sub> while the lowest from T<sub>1</sub> treatment.

**Key words:** Coriander • Chickpea • Chickpea Pod Borer • Intercropping • Insect Suppression.

### INTRODUCTION

Chickpea (*Cicer arietinum* L.) is the important pulse crop in Bangladesh. Chickpea holds the fifth position in regarding both area and production. At present 15 thousand hectare is under chickpea cultivation. There are many constraints in the production of chickpea, of which pod borer (*Helicoverpa armigera*) is the notorious one which causes both qualitative and quantitative loss. On an average, 30-40% pods were found to be damaged and 400 kg/ha grain was lost by this pest [1]. In favorable condition, pod damage goes up to 90-95 percent [2] and [3]. The recommended management strategies of this obnoxious pest in Bangladesh are primarily based on

synthetic insecticides [4]. Preference of insecticides is due to their easy availability and applicability, but their excessive and indiscriminate use has resulted in the development of insecticidal resistance in the pests and environmental pollution [5]. The increasing concern for environmental awareness hazards has evoked a worldwide interest. There is a need to explore alternatives, encompassing available pest control methods and techniques in order to reduce the sole dependence to insecticides. On the other hand coriander is a spices and leafy vegetable crop in Bangladesh. The leaf of coriander contains vitamin A and carotene. The Indian Institute of Vegetable Research conducted such research in order to find out the repellent character of coriander in different

crops. Therefore the present study was taken to observe the repellent character of coriander intercropped with chickpea.

## MATERIALS AND METHODS

The experiment was conducted at the research field of Agronomy Division, Bangladesh Agricultural Research Institute, Joydebpur, Gazipur during rabi season of 2014-2015. The soil belongs to the Chhiata Series under Agro-Ecological Zone-28. The soil was clay loam with acidic in nature (pH 6.1). There were six treatments in the experiment viz. T<sub>1</sub>=Sole Chickpea (40cm line spacing), T<sub>2</sub>=Sole coriander (broadcast), T<sub>3</sub>=100% Chickpea + 25% coriander (One row coriander between two row chickpea), T<sub>4</sub>=100% Chickpea + 50% coriander (Two row coriander between two row chickpea line), T<sub>5</sub>=100% Chickpea + 75% coriander (Three row coriander between two row chickpea line), T<sub>6</sub>=100% chickpea + 100% coriander (Broadcast). The experiment was laid out in Randomized Complete Block Design with three replications. The unit plot size was 4.5 m x 3 m. Seeds of BARI Chola-7 and BARI Dhonia-1 were sown on 12 November, 2014. Fertilizers @ 160-48-120kg ha<sup>-1</sup> NPK were applied at the time of final land preparation in the form of Urea, TSP and MoP, respectively. Except N and K, full amount of other fertilizer was applied at the time of final land preparation but N and K was applied in 2 equal splits at 21 and 45 DAS followed by irrigation. Intercultural operations were done as and when required. Coriander was harvested on 23 March, 2015 and chickpea was harvested 06 April, 2015. Yield component data of coriander and chickpea were collected from 10 randomly selected plants prior to harvest from each plot. At harvest, the yield data was recorded plot wise. Collected data were analyzed statistically and means were adjudged by LSD Test at 5% level of significance using MSTAT-C package. Yield of individual crop was converted into Chickpea equivalent yield (CEY) considering prevailing market price of the crops according to [6]. Benefit cost analyses were also done.

Chickpea equivalent yield (CEY) was calculated by the following formulae;

$$\text{Chickpea equivalent yield (CEY) (kg ha}^{-1}\text{)} = Y_{ich} + \frac{Y_{ic} \cdot P_c}{P_{ch}}$$

Where, Y<sub>ich</sub> = Chickpea yield (kg ha<sup>-1</sup>) in intercropping.  
Y<sub>ic</sub> = Coriander yield (kg ha<sup>-1</sup>) in intercropping

P<sub>ch</sub> = Price of chickpea (TK. ha<sup>-1</sup>)

P<sub>c</sub> = Price of Coriander ((Tk. ha<sup>-1</sup>)

## RESULTS AND DISCUSSION

**Effect of Chickpea:** Yield attributes and yield of chickpea was significantly influenced by coriander and chickpea intercropping system (Table 1). Maximum number of pods plant<sup>-1</sup> (45.67), fresh pods plant<sup>-1</sup> (44.00), tallest plant (35.00 cm), highest 1000 grains wt. (149.70gm.) and highest yield (1.40 t ha<sup>-1</sup>) were obtained from treatment T<sub>4</sub>. Maximum infected pods plant<sup>-1</sup> (5.67) and Branches/Plant (3.26) were obtained from treatment T<sub>1</sub> and T<sub>3</sub> respectively. The minimum number of fresh pods plant<sup>-1</sup> (35.67), shortest plant (32.67 cm), minimum branches/Plant (3.10), lowest 1000 grains wt. (136.70gm.) and lowest yield (1.03t ha<sup>-1</sup>) were obtained from treatment T<sub>1</sub>. Lowest number of pods plant<sup>-1</sup> (40.00) and uninfected pods plant<sup>-1</sup> (1.67) were obtained from treatment T<sub>6</sub> and T<sub>4</sub> respectively. The variation in fruit yield in different treatments might be attributed to inter specific competition and variation of insect infestation due to repellent character of coriander plants.

**Effect of Coriander:** Height/Plant (cm), seeds/plant (no.), population/m<sup>2</sup> and yield (t ha<sup>-1</sup>) of coriander were influenced significantly by intercropping system (Table 2). Significantly the tallest plant (67.00 cm) were found from treatment T<sub>3</sub> and highest number of seeds plant<sup>-1</sup> (405.70), population/m<sup>2</sup> (40.00) and highest yield (1.33t ha<sup>-1</sup>) were recorded from T<sub>2</sub>. The lowest plant height (62.00 cm) and minimum number of seeds plant<sup>-1</sup> (388.70) were found from treatment T<sub>5</sub>, T<sub>6</sub> respectively. The lowest population/m<sup>2</sup> (14.33) and minimum yield (0.37t ha<sup>-1</sup>) were recorded from treatment T<sub>3</sub>. Similar results were recorded by [7] in mungbean intercropped with mukhikachu and [8] in maize/spinach-red amaranth intercropping.

### Effectiveness of Repellent Character of Coriander:

The infestation of pod borer was highest (13.71 %) in treatment T<sub>1</sub> and lowest (3.65 %) in treatment T<sub>4</sub> (Table 3). The reduction of chickpea pod borer infestation was highest (10.06) over sole chickpea was in treatment T<sub>4</sub>.

**Intercrop Efficiency:** Chickpea equivalent yields (CEY) and economic study of Chickpea -coriander intercropping system are presented in Table 4. The highest chickpea equivalent yield (1.786 tha<sup>-1</sup>), highest gross return

Table 1: Yield and yield components of chickpea under coriander + chickpea intercropping system

Treatment	Pods/plant (no.)	Fresh Pods /plant (no.)	Infected Pods /plant (no.)	Height/Plant (cm.)	Branches/Plant (no.)	1000 Grains wt. (gm)	Yield(t ha <sup>-1</sup> )
T <sub>1</sub>	41.33 ab	35.67 b	5.67 a	32.67 a	3.10 c	136.70 b	1.03 c
T <sub>3</sub>	45.67 a	43.67 a	2.00bc	35.00 a	3.26 a	140.30 b	1.23 ab
T <sub>4</sub>	45.67 a	44.00 a	1.67 bc	35.00 a	3.25 a	149.70 a	1.40 a
T <sub>5</sub>	40.67 b	39.00 b	1.67 bc	33.33 a	3.18 b	139.30 b	1.10bc
T <sub>6</sub>	40.00 b	36.00 b	4.00ab	33.67 a	3.11 c	139.00 b	1.17 bc
LSD <sub>(0.05)</sub>	4.764	4.427	2.552	4.855	4.256	8.501	0.1819
CV%	7.36	7.36	56.10	9.44	8.45	3.98	10.06

T<sub>2</sub>=Sole coriander (broadcast), T<sub>3</sub>=100% Chickpea + 25% coriander (One row coriander between two row chickpea), T<sub>4</sub>=100% Chickpea + 50% coriander (Two row coriander between two row chickpea), T<sub>5</sub>=100% Chickpea + 75% coriander (Three row coriander between two row chickpea), T<sub>6</sub>=100% chickpea + 100% coriander (Broadcast).

Table 2: Yield and yield components of coriander under coriander + chickpea intercropping system

Treatment	Height/Plant(cm)	Seeds/Plant(no.)	Population/m <sup>2</sup>	Yield (t ha <sup>-1</sup> )
T <sub>2</sub>	67.00 a	405.70a	40.00 a	1.33 a
T <sub>3</sub>	67.00 a	399.70a	14.33 c	0.37 d
T <sub>4</sub>	65.00 a	403.7 0a	21.33 b	0.60 c
T <sub>5</sub>	62.00b	396.30a	25.67 b	0.63 c
T <sub>6</sub>	65.00 a	388.7 0a	35.67 a	0.93 b
LSD <sub>(0.05)</sub>	2.372	25.35	5.070	0.152
CV%	2.40	4.19	12.21	13.19

T<sub>2</sub>=Sole coriander (broadcast), T<sub>3</sub>=100% Chickpea + 25% coriander (One row coriander between two row chickpea), T<sub>4</sub>=100% Chickpea + 50% coriander (Two row coriander between two row chickpea), T<sub>5</sub>=100% Chickpea + 75% coriander (Three row coriander between two row chickpea), T<sub>6</sub>=100% chickpea + 100% coriander (Broadcast).

Table 3: Effectiveness of different treatments against pod borer

Treatment	Pods/plant (no.)	Infected Pods /plant (no.)	Pod infestation (%)	Reduction of pod infestation over sole chickpea
T <sub>1</sub>	41.33 ab	5.67 a	13.71	-
T <sub>3</sub>	45.67 a	2.00 bc	4.38	9.33
T <sub>4</sub>	45.67 a	1.67 bc	3.65	10.06
T <sub>5</sub>	40.67 b	1.67 bc	4.09	9.62
T <sub>6</sub>	40.00 b	4.00 ab	10	3.71

T<sub>2</sub>=Sole coriander (broadcast), T<sub>3</sub>=100% Chickpea + 25% coriander (One row coriander between two row chickpea), T<sub>4</sub>=100% Chickpea + 50% coriander (Two row coriander between two row chickpea), T<sub>5</sub>=100% Chickpea + 75% coriander (Three row coriander between two row chickpea), T<sub>6</sub>=100% chickpea + 100% coriander (Broadcast).

Table 4: Chickpea equivalent yield (CEY) and benefit cost analysis of chickpea -coriander intercropping system

Treatment	CEY (kg ha <sup>-1</sup> )	Gross return(Tk.ha <sup>-1</sup> )	Cost of production(Tk.ha <sup>-1</sup> )	Gross margin(Tk. ha <sup>-1</sup> )	BCR
T <sub>1</sub>	1,033	72,310	89,000	-16690	0.81
T <sub>2</sub>	857	59,990	89,000	-29010	0.67
T <sub>3</sub>	1,469	1,02,830	89,000	13830	1.16
T <sub>4</sub>	1,786	1,25,020	89,000	36000	1.41
T <sub>5</sub>	1,507	1,05,490	89,000	16490	1.19
T <sub>6</sub>	1,767	1,23,690	89,000	34690	1.38

Selling price (Tk. Kg<sup>-1</sup>): Chickpea =70; coriander = 45;

T<sub>2</sub>=Sole coriander (broadcast), T<sub>3</sub>=100% Chickpea + 25% coriander (One row coriander between two row chickpea), T<sub>4</sub>=100% Chickpea + 50% coriander (Two row coriander between two row chickpea), T<sub>5</sub>=100% Chickpea + 75% coriander (Three row coriander between two row chickpea), T<sub>6</sub>=100% chickpea + 100% coriander (Broadcast).

(Tk. 1, 25,020 ha<sup>-1</sup>), highest gross margin (Tk. 36,000 ha<sup>-1</sup>) and highest benefit cost ratio BCR(1.41) were obtained from treatment T<sub>4</sub>. The lowest chickpea equivalent yield (857 kg ha<sup>-1</sup>), lowest gross return (Tk. 59,990 ha<sup>-1</sup>), lowest gross margin (Tk. -29010 ha<sup>-1</sup>) and lowest benefit cost ratio BCR(0.81) were found in treatment T<sub>1</sub>. Similar results were also obtained by [9],[10] and [11] who found that intercropping systems gave higher total production, gross return, gross margin and benefit cost ratio and greater resource utilization than sole cropping.

### CONCLUSION

The treatment T<sub>4</sub>=100% Chickpea + 50% coriander (Two row coriander between two row chickpea), was suitable for chickpea pod borer insect suppression along with higher production and economic return.

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