

## Response of Rapeseed (*Brassica campestris* L.) To Different Nitrogen Doses and Number of Weeding

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**Abstract:** A field experiment was conducted to study the response of rapeseed cv. SAU Sarisha-1 to nitrogen levels and number of weeding at Sher-e-Bangla Agricultural University Farm, Dhaka, Bangladesh. Plant responded positively to the treatment variables. 120 kg N ha<sup>-1</sup> gave 194.3% and 218.2% increased seed and oil yield over no nitrogen treatment. Plant remained weed free up to 40 DAS gave more seed (17.7%) and oil (18.1%) yield than no weed control treatment. 120 kg N ha<sup>-1</sup> along with two hand weeding at 20 DAS and 40 DAS supported plants for optimum growth and development thus resulted in maximum seed yield and quality seed. Seed yield was positively related with number of branches per plant, number of siliquae per plant, number of seeds per siliqua and 1000-seed weight.

**Key words:** Rapeseed • Nitrogen • Weeding • Yield • Oil content

### INTRODUCTION

Rapeseed belonging to the family Cruciferae is one of the important oilseed crops and currently ranked as the world's third important oil crop in terms of production and area. Rapeseed (*Brassica campestris* L.) is the principal oil crop of Bangladesh. It is in the top of the list in respect of area and production compared to the oilseed crops cultivated in this country [1]. However, the average yield of rapeseed in Bangladesh is very low (0.73 t ha<sup>-1</sup>), which is about 50% lower than world average [2]. A major reason of the lower yield of rapeseed may be due to lack of proper management in cultivation systems. The yield of rapeseed can be raised with the use of high yielding varieties and appropriate agronomic management.

The optimum rate of nitrogen application plays an important role in increasing the seed and oil yields through optimum nutrient uptake and utilization. Street *et al.* [3] reported maximum seed yield with 135 kg N ha<sup>-1</sup> under irrigated conditions of Bangladesh. Rapeseed is highly responsive to nitrogen and produces maximum seed yield at optimum dose [4-6].

Yield of rapeseed is also hampered by different pests. Among them weed is an important factor in reducing yields. Weeds affect the plant growth, yield and quality of rapeseed. *Brassica* oil crops are sensitive to weeds competition, particularly in the early stages of growth. It was observed that the seed yield reduced by

46% with lower quality seed when plants are not weed free during their growth stages [7]. Two hand weeding or mechanical weeding at 20 and 40 days after seeding (DAS) resulted in higher yield compared to that of control [8]. Hence, the present trial was undertaken to study the response of rapeseed cv. SAU Sarisha-1 under optimum dose of nitrogen and number of weeding.

### MATERIALS AND METHODS

The research was conducted at Sher-e-Bangla Agricultural University Farm, Dhaka-1207, Bangladesh during winter season (November to February) of 2005-2006. The land was medium high and well drained. Temperature during the cropping period ranged between 12.2°C and 31.2°C. The humidity varied from 73.52% to 81.2%. The day length ranged between 10.5 and 11.0 hours and there was no rainfall during the experimentation. The soil of the experimental site belongs to the agro-ecological region of "Madhupur Tract" (AEZ No. 28). The top soil was silty clay loam in texture. Organic matter content was very low (0.82%) and soil pH varied from 5.47 - 5.63.

Four levels of nitrogen viz. 0 (N<sub>1</sub>), 90 (N<sub>2</sub>), 120 (N<sub>3</sub>) and 150 kg ha<sup>-1</sup> (N<sub>4</sub>) and three levels of weeding viz. no weeding (W<sub>0</sub>), one weeding at 20 DAS (W<sub>1</sub>) and two weeding at 20 and 40 DAS (W<sub>2</sub>) were used as treatment variables imposed on a HYV of rapeseed, SAU Sarisha-1.

The experiment was laid out in a Randomized Complete Block Design (Factorial) with three replications.

Seeds were sown on October 15, 2005 maintaining 30 cm row spacing in each plot. Sowing was done continuously in rows which were maintained as 5 cm plant to plant distance after thinning at 15 DAS. Fertilizers were applied as recommended dose except nitrogen which was applied as per treatment. Weeding was done following treatment variables and others intercultural operations were done according to the requirements. The experimental plots were found to be infested with different kinds of weeds, viz. Lambsquarter (*Chenopodium album* L.), Bermuda grass (*Cynodon dactylon*), Nut sedge (*Cyperus rotundus* L.), Water Pepper (*Polygonum hydropiper* L.), Goose grass (*Eleusine indica*) etc. Weeding was done manually with 'nirani'.

Ten plants were taken out randomly from each plot leaving the border plants to collect data on plant characters and yield attributes. Seed yield was determined from 2.4 m<sup>2</sup> at the center of each plot. The oil content (%) of seed was determined by Soxhlet method [9]. The data were analyzed following Analysis of Variance (ANOVA) technique using the statistical computer programme ALPHA and MSTAT-C v.1.2. Means were compared by using LSD test at 5% level of significance. The relationship analysis was done by SPSS v. 13.1 Software. Regression was measured and plotted with the Microsoft Excel 2003 Software.

## RESULTS AND DISCUSSION

**Effect on plant characters:** Nitrogen levels progressively increased plant height and number of branches per plant at harvest in this experiment (Table 1). The significant maximum height (72.40 cm) and number of branches per plant (5.75) were observed from 150 kg N ha<sup>-1</sup>. These findings are in agreement with those of Singh *et al.* [10], Ozer [11], Singh *et al.* [12] and Tarafder and Mondal [13]. These two parameters were also influenced by the number of weeding (Table 1). The tallest plants with maximum number of branches was produced with two weeding at 20 and 40 DAS. The plant height and the number of branches per plant were found minimum with no weeding. In case of the combination of nitrogen doses and number of weeding, maximum plant height with more branches was found in plots treated with 150 kg N ha<sup>-1</sup> and two weedings at 20 and 40 DAS (N<sub>3</sub>W<sub>2</sub>). The lowest plant height and number of branches per plant were found from the interaction of no nitrogen and no weeding (control).

Table 1: Plant characters and yield attributes of rapeseed cv. SAU Sarisha-1 as affected by nitrogen levels, number of weeding and their combined effect

Treatments	Plant height at harvest (cm)	No. of branches plant <sup>-1</sup>	No. of siliquae plant <sup>-1</sup>	No. of seeds siliqua <sup>-1</sup>	1000-seed weight (g)
Nitrogen levels					
N <sub>0</sub>	62.63	3.65	56.70	17.12	2.09
N <sub>1</sub>	66.47	4.89	62.00	17.67	2.72
N <sub>2</sub>	70.63	4.91	72.54	19.91	3.16
N <sub>3</sub>	72.40	5.75	68.12	18.83	2.88
LSD 0.05	1.05	0.18	0.38	0.30	0.16
Number of weeding					
W <sub>0</sub>	67.45	4.44	64.01	18.11	2.55
W <sub>1</sub>	68.02	4.66	64.97	18.40	2.72
W <sub>2</sub>	68.63	4.92	65.72	18.64	2.86
LSD 0.05	0.908	0.15	0.97	0.26	0.14
Nitrogen levels × Number of weeding					
N <sub>0</sub> W <sub>0</sub>	62.30	3.70	56.52	17.20	2.20
N <sub>0</sub> W <sub>1</sub>	63.70	3.90	58.00	17.50	2.30
N <sub>0</sub> W <sub>2</sub>	65.70	4.10	61.00	17.50	2.60
N <sub>1</sub> W <sub>0</sub>	66.80	4.46	62.50	17.67	2.65
N <sub>1</sub> W <sub>1</sub>	66.90	4.60	63.17	17.83	2.80
N <sub>1</sub> W <sub>2</sub>	70.20	4.73	68.37	18.00	2.91
N <sub>2</sub> W <sub>0</sub>	70.70	4.80	69.0	18.50	3.04
N <sub>2</sub> W <sub>1</sub>	71.00	5.20	72.50	20.00	3.20
N <sub>2</sub> W <sub>2</sub>	72.00	5.56	72.70	20.50	3.26
N <sub>3</sub> W <sub>0</sub>	72.30	5.70	67.00	18.77	2.85
N <sub>3</sub> W <sub>1</sub>	72.90	6.00	70.72	19.23	3.00
N <sub>3</sub> W <sub>2</sub>	73.10	6.01	72.43	19.77	3.24
LSD 0.05	1.81	0.31	1.94	0.53	0.29
CV (%)	5.58	4.02	7.77	8.70	6.32

N<sub>0</sub> = 0 kg N ha<sup>-1</sup>, N<sub>1</sub> = 90 kg N ha<sup>-1</sup>, N<sub>2</sub> = 120 kg N ha<sup>-1</sup> and N<sub>3</sub> = 150 kg N ha<sup>-1</sup>

W<sub>0</sub> = No weeding, W<sub>1</sub> = One hand weeding at 20 DAS, W<sub>2</sub> = Two hand weeding at 20 and 40 DAS

Weeding facilitates the plants to have more resources which rendering the increased plant height and also more number of branches per plant in this experiment. This result corroborated with the findings of Gaffer [14].

**Effect on yield attributes:** Yield attributes like number of siliquae per plant, seeds per siliqua and 1000 seed weight were found significantly affected with nitrogen levels, number of weeding and their combined effect (Table 1). The increment of yield attributes was noticed from zero nitrogen to 120 kg N ha<sup>-1</sup> then it reduced with further added nitrogen (150 kg ha<sup>-1</sup>). 120 kg N ha<sup>-1</sup> (N<sub>2</sub>) produced

Table 2: Yield, harvest index, oil content and oil yield of rapeseed cv. SAU sarisha-1 as affected by nitrogen levels, number of weeding and their combined effect

Treatments	Seed yield (kg ha <sup>-1</sup> )	Harvest index (%)	Oil content (%)	Oil yield (kg ha <sup>-1</sup> )
Nitrogen levels				
N <sub>0</sub>	796.30	37.75	40.08	319.10
N <sub>1</sub>	1369.50	39.43	42.14	577.20
N <sub>2</sub>	2343.40	45.47	43.33	1015.30
N <sub>3</sub>	2192.60	43.48	42.66	935.50
LSD 0.05	101.10	1.59	0.30	92.15
Number of weeding				
W <sub>0</sub>	1540.10	41.86	41.91	653.20
W <sub>1</sub>	1673.20	43.01	42.06	710.90
W <sub>2</sub>	1812.20	42.03	42.19	771.30
LSD 0.05	108.14	1.38	NS	89.71
Nitrogen levels × Number of weeding				
N <sub>0</sub> W <sub>0</sub>	833.70	35.39	40.05	333.90
N <sub>0</sub> W <sub>1</sub>	913.00	42.20	40.20	366.60
N <sub>0</sub> W <sub>2</sub>	1251.20	41.01	41.93	524.90
N <sub>1</sub> W <sub>0</sub>	1335.20	40.24	42.20	563.70
N <sub>1</sub> W <sub>1</sub>	1520.10	40.62	42.30	642.90
N <sub>1</sub> W <sub>2</sub>	2223.40	43.78	42.53	960.60
N <sub>2</sub> W <sub>0</sub>	2046.10	42.39	42.70	870.30
N <sub>2</sub> W <sub>1</sub>	2383.60	45.47	43.30	1029.60
N <sub>2</sub> W <sub>2</sub>	2430.20	45.60	43.50	1057.50
N <sub>3</sub> W <sub>0</sub>	2147.20	43.31	42.75	917.20
N <sub>3</sub> W <sub>1</sub>	2375.60	44.27	43.20	1018.20
N <sub>3</sub> W <sub>2</sub>	2406.20	44.47	43.31	1046.93
LSD 0.05	110.30	2.76	0.53	102.67
CV (%)	6.79	3.93	4.66	6.78

N<sub>0</sub> = 0 kg N ha<sup>-1</sup>, N<sub>1</sub> = 90 kg N ha<sup>-1</sup>, N<sub>2</sub> = 120 kg N ha<sup>-1</sup> and N<sub>3</sub> = 150 kg N ha<sup>-1</sup>

W<sub>0</sub> = No weeding, W<sub>1</sub> = One hand weeding at 20 DAS, W<sub>2</sub> = Two hand weeding at 20 and 40 DAS

significantly highest number of siliquae per plant (72.54), number of seeds per siliqua (19.91) and 1000-seed weight (3.16 g) than any other treatment. These were 27.9%, 16.3% and 51.2% greater than those from zero nitrogen (N<sub>0</sub>) treated plants respectively. On the other hand these parameters were increased remarkably with the increase in weeding number. Plants were given two hand weeding at 20 DAS and 40 DAS produced significantly higher number of siliquae per plant (65.72), number of seeds per siliqua (18.64) and 1000-seed weight (2.86 g) which was followed by treatment W<sub>1</sub> (one hand weeding at 20 DAS). Plants under weed

competition (W<sub>0</sub>) gave the lowest yield parameters. Number of weeding could not bring any positive influence on plant production while no nitrogen was given to the plant. Weeding was very much effective while combined with optimum nitrogen dose (N<sub>2</sub>W<sub>2</sub>) in the production of siliquae per plant, number of seeds per siliqua and 1000-seed weight and these were significantly higher than those of weeding treatment with reduced nitrogen doses. Singh *et al.* [10], Ozer [11] and Singh *et al.* [12] reported increased number of siliquae per plant, number of seeds per siliqua and 1000-seed weight, respectively with 120 kg N ha<sup>-1</sup>. Sarkar and Mondal [15] observed more seeds in a single pod with two weeding in mungbean plants.

**Effect on seed yield, harvest index, oil content and oil yield:** It was seen from Table 2 that nitrogen levels, number of weeding and their combined effect had significant influence on plants in the production of seed yield, harvest index, oil content and oil yield. Treatment 120 Kg N ha<sup>-1</sup> (N<sub>2</sub>) gave the maximum seed yield (2343.40 kg ha<sup>-1</sup>), harvest index (45.47%), oil content (43.33%) and oil yield (1015.30 kg ha<sup>-1</sup>). Plants with no nitrogen gave very lower quantity of these parameters. Seed yield and oil yield with 120 Kg N ha<sup>-1</sup> were increased by 194.3% and 218.2% over no nitrogen treatment. Plants remained free from weed competition up to 45 DAS (W<sub>2</sub>) gave significantly more seed yield (1812.20 kg ha<sup>-1</sup>), oil content (42.19%) and oil yield (771.30 kg ha<sup>-1</sup>). The second important weeding treatment was W<sub>1</sub> (one hand weeding at 20 DAS) that gave intermediate seed yield, oil content and oil yield but maximum harvest index. Treatment W<sub>2</sub> out yielded W<sub>0</sub> by 17.7% more seed yield and 18.1% more oil yield. On the other hand, 120 Kg N ha<sup>-1</sup> along with two hand weeding at 20 DAS and 40 DAS produced significantly higher seed yield (2430.50 kg ha<sup>-1</sup>), harvest index (45.60%), oil content (43.50%) and oil yield (1057.50 kg ha<sup>-1</sup>). Any number of weeding combined with lower doses of nitrogen gave lesser quantity of seed yield, oil content, harvest index and oil yield. The control treatment (N<sub>0</sub>W<sub>0</sub>) produced significantly lowest amount of all these parameters. Singh *et al.* [10] and Singh *et al.* [12] observed maximum seed yield of rapeseed/mustard with 120 kg N ha<sup>-1</sup>. Sarkar and Mondal [15], Chemale and Fleck [16] and Bhadoria and Chauhan [17] reported that weeding for two times gives more seed yield in mungbean, soybean and mustard, respectively.

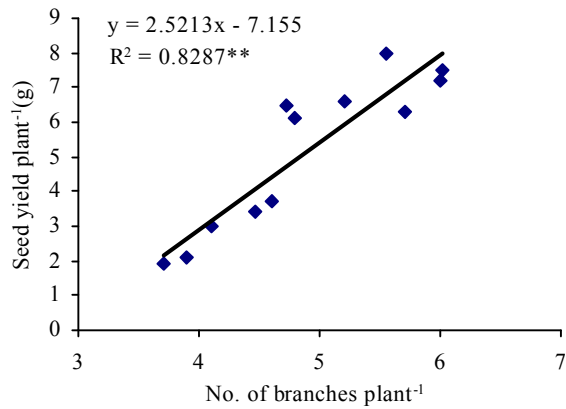


Fig. 1: Relationship between number of branches and seed yield

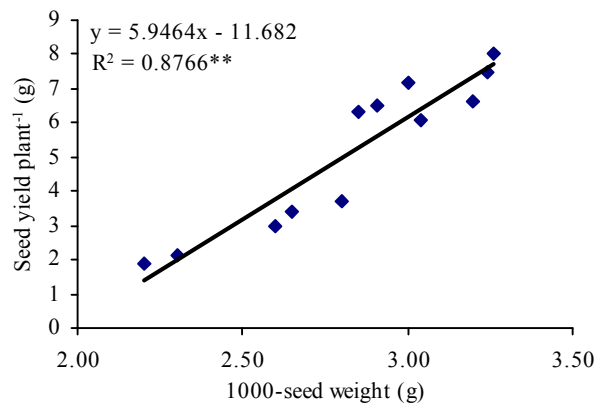


Fig. 4: Relationship between 1000-seed weight and seed yield

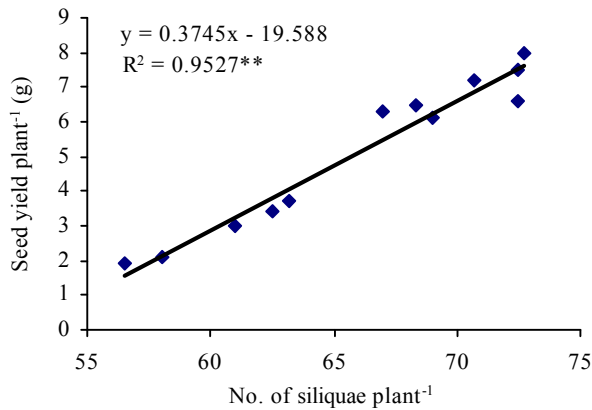


Fig. 2: Relationship between number of siliques and seed yield

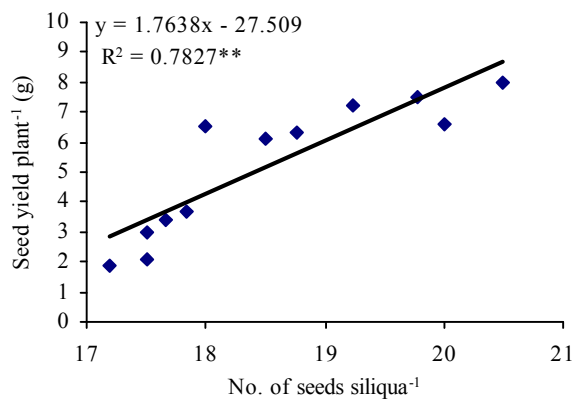


Fig. 3: Relationship between number of seeds siliqua<sup>-1</sup> and seed yield

It was evident from Fig. 1, 2, 3 and 4 that number of branches per plant, number of siliques per plant, number of seeds per silique and 1000-seed weight had a positive and significant relationship with seed yield. This findings

might be positive argument for the favorable treatments those raised seed yield with the increased of yield parameters like siliquae per plant, seeds per siliqua and 1000-seed weight.

## CONCLUSIONS

It is concluded that rapeseed might be given 120 kg N ha<sup>-1</sup> along with two weeding at 20 and 40 DAS to achieve maximum plant characters, yield attributes, seed yield and oil yield by the plants. However, to reach a scientific conclusion and recommendation, the trial should be conducted over different agro-ecological zones in Bangladesh.

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