EFFECT OF SOWING METHODS AND SEED RATES ON PRODUCTION PARAMETERS AND AVERAGE CHEMICAL COMPOSITION OF FODDER MAIZE cv. SAVAR-1

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Summary

Hand dibbling in rows produced higher ($p < 0.05$) fresh and dry matter (DM), fodder yield, higher plant density and cob yield than broadcasted. However, the varying seed rates (40, 50 and 55 kg/ha) did not affect ($p < 0.05$) the fresh and DM yield and cob yield except for 30 kg/ha seed rate which produced the lowest ($p < 0.01$).

However, the overall average fresh fodder yield and the fresh and DM yield of cob were 24.97, 10.04 and 6.90 t/ha respectively. The overall average plant height (cm), cob/plant (nos.) plant/ha, (nos.) cob/ha (nos.) and weight (g) of one cob were 178, 1.11, 664141, 70104 and 145 respectively for both the sowing methods and the four seed rates. Crude protein contents of maize plant and cob by-products (8.12% and 7.34% respectively) indicated promising cattle feeds along with human food.

(**Key Words**: Fodder Maize, Sowing Method, Seed Rate)

Introduction

Maize is now a potential cereal crop next to rice and wheat to be extended for its higher productivity and versatile use, higher nutritive values and intercropping potential. Sowing methods are broadcasting, sowing behind the plough (i.e. drilling) and dibbling (making a shallow hole by a peg to put seed in the hole) (Islam and Kaul, 1986). Seed rate varies depending on the grain size, seed viability and the purpose of production. For the grain crop, seed rates ranging from 20 to 30 kg/ha (depending on grain size) are quite sufficient but for a fodder crop seed rate would increase up to 70 90 kg/ha seed (Islam and Kaul, 1986). However, the Directorate of Livestock Services (DLS) use 60 kg/ha seed for seed production. Soil fertility is an important factor but optimum plant density can minimise commercial N-fertilizer use (Bangarwa et al., 1988).

In order to popularize fodder maize production and extension, cost effective low-cost practices should be explored. Hence a field experiment was conducted to determine better sowing method and seed rate for optimum yield and yield components at a moderate application of commercial fertilizer for fodder maize extension which is taken up by the Directorate of Agricultural Extension (DAE) the DLS and many other Non-Governmental Organization (NGOs) country wide as mass campaign.

Materials and Methods

The experiment was conducted in the fields of Bangladesh Livestock Research Institute in the winter *Rabi* season of 1989. The soil was clayay soil of Modhupur tract, low in nitrogen and slightly acidic in reaction. The experiment was laid out in 2×4 factorial experiment with two different sowing methods (broadcasting and 50 cm apart row to row dibbling) and four different seeding rates (30 kg/ha, 40 kg/ha, 50 kg/ha and 55 kg/ha) with three replications for each, thus making 24 sub-plots. Each sub-plot size was 6 m $\times$ 8 m. Land was thoroughly prepared by two ploughings followed by four ladderings and 15 tons per hectare basis of com-

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posted cowdung were applied to the field (75 kg/ 48 m^2) and the sub-plots were thus prepared. A basal dressing of commercial NPK at the rate of 15/15 (15 kg N/ha was top dressed at the time of tassling in the form of urea)-30-15 kg/ha was applied. Local seeds (Fodder Cultivar-Savar 1) were hand broadcasted and hand dibbled as per randomized complete block desing (RCBD) in the sub-plots in mid October and harvested in late January when cobs were yellow ripe (hard). Data on fresh matter of whole plants, cobs and stovers were recorded through sampling prior to harvest and at final stage of the stands. The proximate composition analysis of harvest components were being done at the BLRI nutrition laboratory followed by A. O. A. C. procedures (1970) and statistical analysis was followed by Calub et al. (1988).

Results and Discussion

Hand dibbling in rows (50 cm apart) produced significantly ($p < 0.05$) higher total fresh and dry matter fodder yield, higher plant density and cob yield than broadcasted (table 1). These indicate that row interface offered optimum niche for germination, later on nutrients-uptake and consequent vegetative and generative growth and development. However, the sowing method did not affect plant height and number of cob per plant indicating that even at closer spacing (Broadcasting method) plants were not overcrowded which could affect the plant height and cob yield. On the contrary moderate plant population through hand dibbling increased the total leaf area index, which was maximum at yellow ripe stage and had higher DM accumulation in stover yield. Furthermore, the varying seed rates 40 kg/ha, 50 kg/ha and 55 kg/ha did not produce significantly different fresh stovers except 30 to kg/ha when broadcasted, which produced the lowest total fresh stover. However the varying seed rates did not affect plant height and number of cobs per plant. The higher seed rates 50 kg/ha and 55 kg/ha produced the highest plant population among all combinations when dibbled in rows (table 2). On the other hand, the minimum application of NPK (15/15-30-15 kg/ha) and

TABLE 1. EFFFCT OF SOWING METHOD AND SEED RATE (MEAN ± SEM) ON THE PRODUCTION PARAMETERS OF MAIZE

Treatment	Subclass	Fresh yield (ton/ha)	Plant height (cm)	Cob/plant (nos)	No. of plant (per ha)
Sowing method	Row	28.67 ± 1.93^a	180.4 + 3.59^a	1.09 ± 0.02^a	76,523.14 ± 4336^a
	Broadcast	21.26 ± 1.91^b	174.73 ± 3.13^a	1.12 ± 0.02^a	51,758.8 ± 4332^b
Seed rate kg/ha	30	20.68 ± 3.37^b *	176.25 ± 82^a	1.17 ± 0.03^a	49,427.0 ± 7922^b
	40	27.01 + 2.44^a	177.29 + 5.0^a	1.10 ± 0.02^a	66,016.6 + 6133^a
	50	25.61 ± 3.13^a	184.26 ± 4.10^a	1.07 ± 0.02^a	67,769.0 ± 8981^a
	55	26.56 ± 2.34^a	171.21 ± 4.92^a	1.08 ± 0.01^a	73,359.00 ± 4619
	Overall	24.97 ± 1.49	177.56 ± 2.38	1.11 ± 0.01	64,141.0

Treatment	Subclass	No. of plant (per ha)	Wt. of one cob (g)	Cob yield (ton/ha)
Sowing method	Row	82,785.0^a	140.12^a	11.59
	Broadcast	57,421.0^b	150.05^a	8.62
Seed rate kg/ha	30	57,004.0	151.55^a	8.64
	40	72,108.0^a	150.0^a	10.82
	50	72,004.0^a	145.81^a	10.50
	55	79,229.0^a	133.0^a	10.54
	Overall	70,104.00	145.10	10.17

^{ab} Means having dissimilar superscripts in each trait of each main effect subclass differs ($p < 0.05$).
* $p < 0.01$.

TABLE 2. PRODUCTION PERFORMANCE OF MAIZE (MEAN ± SEM) ACCORDING TO SOWING METHOD AND DIFFERENT SEED RATE

Parameter	30 kg		40 kg	
	Row	B. cast	Row	B. cast
Fresh yield (ton/ha)	26.55^{a} ± 4.46	14.8 ± 3.23	30.4^{a} ± 4.06	23.62^{a} ± 1.91
Plant height (cm)	171.87^{a} ± 7.45	150.62^{a} ± 6.15	178.37^{a} ± 7.99	176.2^{a} ± 6.33
Cob/plant (no's)	1.17^{a} ± 0.06	1.17^{a} ± 0.05	1.07^{a} ± 0.01	1.12^{a} ± 0.04
Plant/ha (no's)	$67,188.0^{ab}$ ± 4,764	$31,668.0^{f}$ ± 7,762	$75,313.0^{ac}$ ± 20,590	$5,619.0^{ef}$ ± 2,973
No. of cob/ha	78,125.0	35,885.4	80,365.0	63,854.0
Cob yield (ton/ha)	10.99^{a} ± 0.58	5.87^{b} ± 1.37	12.0^{a} ± 1.6	9.61^{a} ± 0.47
DM yield	7.37^{a} ± 1.23	4.10^{b} ± 0.87	8.37^{a} ± 1.12	6.52^{ab} ± 0.52

Parameter	50 kg		55 kg	
	Row	B. cast	Row	B. cast
Fresh yield (ton/ha)	27.55^{a} ± 4.92	23.67^{a} ± 4.38	30.17^{a} ± 3.22	22.95^{a} ± 4.14
Plant height (cm)	187.67^{a} ± 5.95	180.85^{a} ± 5.67	181.17^{a} ± 7.10	161.25^{a} ± 6.54
Cob/plant (no's)	1.04^{a} ± 0.01	1.10^{a} ± 0.04	1.07^{a} ± 0.01	1.10^{a} ± 1.01
Plant/ha (no's)	$81,771.0^{a}$ ± 12,988	$53,750.0^{bcdef}$ ± 8,792	$81,823.0^{a}$ ± 4,953	$64,896.0^{ac}$ ± 5,230
No. of cob/ha	85,156.0	5,884.0	87,500.0	71,894.0
Cob yield (ton/ha)	11.5^{a} ± 1.85	9.21^{a} ± 1.48	11.83^{a} ± 0.86	9.34^{a} ± 0.71
DM yield	7.60^{a} ± 1.35	6.50^{ab} ± 1.2	8.31^{a} ± 0.88	6.34^{ab} ± 1.27

^{abcdef} Means having dissimilar superscripts in each row differs ($p < 0.05$)

composted cowdung (15 t/ha) could even produce such higher plaint population as found by Bangarwa et al., (1988) in All-India Co-ordinated Maize Improvement Project (ICAR) with also relatively higher fertilizer doses.

The DM yield of maize stover showed significant ($p < 0.01$) higher yields for row dibbling with a maximum yield of 8.37 t/ha DM for row dibbling with 40 kg/ha seed rate. However other seed rates did not affect DM yields when dibbled. The higher seed rates did not affect DM stover production when dibbled. The higher seed rates did not affect DM stover production when broadcasted except for 30 kg/ha which produced the lowest DM-yields significantly ($p < 0.01$). Higher cob yield (table 1) were obtained through row

dibbling. However seed rates did not affect cob yield suggesting that the seed rates were still low to increasing population density and hence the poorer development. Table 3 showed that the average chemical composition of whole maize plant, seed, leaves, stover, cob and by-product. The comparatively higher dry matter and crude protein content of different yield attributes indicate a good livestock feed as basal diet. Similar views were expresed by Sattar et al. (1991) that all of the components of fodder maize can be utilized with higher efficiency as ruminant feed in feed scarce period.

TABLE 3. AVERAGE CHEMICAL COMPOSITION (MEAN ± SEM) OF DIFFERENT PARTS OF MAIZE (N = 3)

Components	Dry matter (%)	Crude protein	Crude fiber	Ether extract	*Ash*	Nitrogen free extract
			g per 100 g dry matter			
Whole plant	326.86 + 0.58	8.12 ± 0.19	27.79 ± 0.56	1.63 ± 0.03	7.83 + 0.16	54.62 ± 0.63
Corn (maize seed)	89.63 ± 0.31	9.62 ± 0.23	3.16 ± 0.21	3.92 ± 0.02	2.10 ± 0.07	81.19 ± 0.04
Leaves and stem	243.34 ± 0.44	7.29 ± 0.12	28.67 ± 0.37	1.75 ± 0.62	8.32 ± 0.04	64.0 ± 0.37
Cob	52.27 ± 0.36	9.64 ± 0.24	6.01 ± 0.37	3.53 ± 0.01	7.92 ± 0.01	72.77 ± 0.42
Cob by product	46.79 ± 0.38	7.34 ± 0.09	25.24 ± 0.58	1.62 ± 0.01	7.75 ± 0.03	57.58 ± 0.59

Conclusion

Maize is perhaps the most potential seasonal cereal crop next to annual sugar cane for its higher productivity and diverse uses by virtue of its capability of solar interception which is the most advantage in the tropical and subtropical belt like Bangladesh. Dibbling of Savar-1 variety in rows at 50 cm apart with a seed rate of 40 kg/ha and minimum fertilizer application (15/15 -30-15 kg/ha NPK) can produce optimum fresh yields and other yield attributes stated in the paper. This technology requires a small scale investment suitable to rural small holders with animals both for food subsistence and basal feed.

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