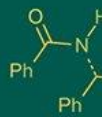


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Effect of date of sowing and varieties on yield parameters in *Spring* maize (*Zea mays* L.)

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Abstract

The present investigation entitled "Effect of date of sowing and varieties on yield parameters in spring maize (*Zea mays* L.)" was carried out during *Spring* season of 2022 at Nawabganj Farm, Chandra Shekhar Azad University of Agriculture and Technology, Kanpur. The field experiment included two factors, viz, dates of sowing (11th March & 1st April) and varieties (DKC-9248, DKC-9108, Pioneer-3355, DKC-9208 and Pioneer-1899) was laid out in split plot design and replicated four times.

The date sowing on 11th March recorded better growth, yield attributes and grain yield (53.79 q/ha) and harvesting index (31.45%) of maize crop. Among maize varieties tested viz. DKC-9248 exhibited maximum grain yield (63.77q/ha) and harvest index (30.84%) compared to other tested varieties. As regard physiological parameters sowing date on 11th March recorded maximum RGR at 60 to 90 days (40.37 mg/g/day). Among varieties respectively Pioneer-1899 recorded maximum RGR (40.63 mg/g/day).

Keywords: Maize, date of sowing, cob plant⁻¹, cob length, cob weight plant, number of row cob⁻¹ number grains row⁻¹, grain weight cob⁻¹, grain yield (q ha⁻¹) and harvest index

1. Introduction

The most frequently grown crop in the world is maize (*Zea mays* L.), a domesticated cereal grain that originated in Central America. One of the most adaptable developing crops, it has a wide range of uses. Globally, maize is the due to its maximum genetic production potential; it is referred to as queen of cereals.

Only maize can be cultivated in a wide range of climates, ecosystems, and environments. In addition to this, there are numerous varieties of maize, including regular yellow-white grain, sweet corn, baby corn, popcorn, waxy corn, high-amylase corn, high-oil corn, and quality protein maize, among others. In addition, maize is a crucial industrial raw material that offers significant potential for value addition.

It is grown in 166 nations with greater variation in soil, temperature, biodiversity, and management techniques, covering more than 160 million ha worldwide. Among the food cereal crops, maize contributes the most, at 40% annually. (More than 800 metric tonnes) of food are produced worldwide. The largest producer of maize globally is the United States, which accounts for about 35% of global production. China comes in second with over 20% of global production and an equivalent acreage. The crop with the highest productivity in the US is maize (> 10 t ha⁻¹), which is twice as productive as the world average of 5.3 t ha⁻¹.

In India maize is the third most important food crops after rice and wheat. According to 4th advance estimate its production is likely to be 31.51 M Tones (2020-21) mainly during *Kharif* season which covers 80% area. According to latest final data (2019-20) it is being cultivated on 9.57 m ha area, 28.77 MT production with average 30.06 q/ha productivity in India and 0.73 mha area, 1.69MT production with average 23.31 q/ha productivity in Uttar Pradesh (Agri. Stat. at a glance 2021). Despite maize being predominantly rainfed crop its productivity is more than rice which is mainly grown under assured irrigated/rainfed conditions. Maize grain contains about 10% protein, 4%oil, 70% carbohydrate 2.3 crude fibres, 10.4% albuminoids, 1.4% ash. Maize is primarily used for feed (60%) followed by human food (24%), industrial (starch) products (14%) beverages and seed (1% each).

Thus, maize has attained an important position as industrial crop because 75% of its produced is used in starch and feed industries.

Maize can be grown successfully in different of soils ranging from loamy sand to clay loam. However, soils with good organic matter content having high water holding capacity with neutral pH are considered good for higher productivity. Being a sensitive crop to moisture stress particularly excess soil moisture and salinity stresses; it is desirable to avoid low lying fields having poor drainage and also the field having higher salinity. Therefore, the fields having provision of proper drainage should be selected for cultivation of maize.

Growth and development are different concepts although they have related stages. Plant growth refers to irreversible increase in organ or whole plant size (length, area, volume and weight), while plant development refers to processes related to cell differentiation, organ initiation, member appearance, and extends to plant senescence. Selection of adapted genotypes and field plant management practices such as fertilization, pest's control and irrigation arrangement was reported by Streck *et al.* (2003). Temperature is a major environmental agent that determines the rate of plant growth and development.

2. Materials and Methods

A field experiment was carried out during *Spring* season of 2022 at Nawabganj Farm of Chandra Shekhar Azad University of Agriculture and Technology, Kanpur (U.P.), India. The experiment was comprised of five genotype namely- DKC-9208(V₁), DKC-9248(V₂), DKC-9108(V₃), Pioneer-3355(V₄) and Pioneer-1899(V₅) and two different date of sowing viz. 11th March(D₁) and 1st April(D₂). The experiment was laid out in split plot design with three replications. The DKC-9208, DKC-9248, DKC-9108, Pioneer-3355 and Pioneer-1899 were used as a test crop sown in line mark at 60 cm row to row and 25 cm of plant to plant distance. A common dose of 120 kg N, 60 kg P₂O₅ and 40 kg K₂O per ha was applied in the form of urea, DAP and MOP respectively. All agronomic practices were applied equally to each experimental plot.

2.1 Number of cob plant⁻¹

The total number of grains from five randomly selected cobs from the tagged plants was counted row-wise, averaged, and expressed as the number of grains per row.

2.2 Cob length (cm)

The length of five randomly selected cobs from the tagged plants was measured from the base to the tip of the cob using a standard calibrated measuring scale. The values were averaged and expressed in centimetres (cm).

2.3 Cob weight plant⁻¹ (g)

The cobs harvested from the five representative plants were

weighed individually on a precision electronic digital balance. The total weight of the cobs was divided by five to determine the average cob weight per plant in grams (g).

2.4 Number of row cob⁻¹

The longitudinal grain rows on five randomly chosen cobs from the tagged sample plants were counted manually around the circumference of the cob. The mean value was calculated to represent the number of rows per cob.

2.5 Number grains row⁻¹

Five representative cobs were selected at random from the tagged plants in the net plot of each treatment combination. The grains present in three distinct longitudinal rows (well-filled rows) of each individual cob were counted manually from the base to the tip. The values obtained from all rows and cobs within the treatment were averaged to determine the mean number of grains per row.

2.6 Grain weight cob⁻¹ (g)

Cobs harvested from the five tagged plants were shelled carefully. The extracted grains were weighed, and the average grain weight per cob was recorded in grams (g) after adjusting the moisture content to a uniform standard (typically 14%).

2.7 Grain yield (q ha⁻¹)

The total weight of grains obtained from the net plot area after threshing and standard drying was recorded. This net plot yield was subsequently converted into quintals per hectare (q ha⁻¹).

2.8 Harvest index (%)

The harvest index-representing the efficiency of the crop in converting photosynthates into economic yield-was computed using the standard formula:

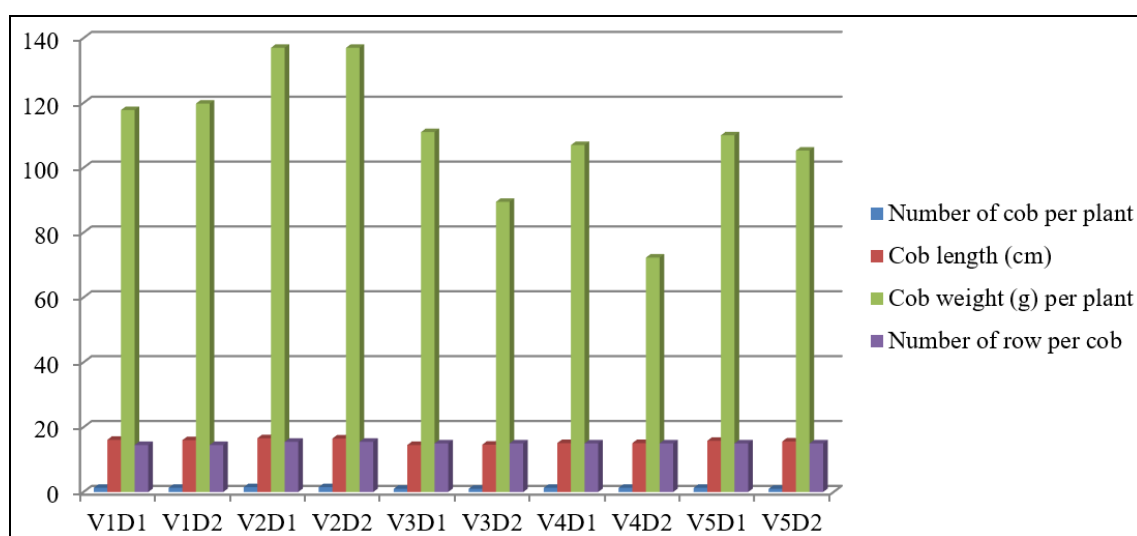
$$\text{Harvest Index (\%)} = \frac{\text{Economic Yield (Grain Yield)}}{\text{Biological Yield (Grain+Straw)}} \times 100$$

3. Results and Discussion

The statistical evaluation of the pooled data demonstrates that Variety 2 under the lower plant density (V₂D₁) is the most outstanding treatment combination, achieving the maximum grain yield of 64.73 q ha⁻¹, driven by superior yield-attributing traits such as cob length (16.6 cm), cob weight (137.0 g plant⁻¹), number of grains per row (38.5), and grain weight per cob (114.3 g). While rigid structural parameters like the number of cobs per plant and rows per cob remained statistically unaffected by treatments due to strong genetic regulation, crowded density conditions (D₂) triggered intense intraspecific competition that significantly depressed cob weights and overall grain yields across most varieties.

Table 1: Effect of date of sowing and varieties on number of cob plant⁻¹, cob length (cm), cob weight plant⁻¹ (g) and number of row cob⁻¹ in Spring Maize

Treatments	Number of cob plant ⁻¹	Cob length (cm)	Cob weight plant ⁻¹ (g)	Number of rows cob ⁻¹
V ₁ D ₁	1.3	16.1	117.8	14.5
V ₁ D ₂	1.3	16.0	119.8	14.5
V ₂ D ₁	1.5	16.6	137.0	15.5
V ₂ D ₂	1.5	16.5	137.0	15.5
V ₃ D ₁	1.0	14.5	111.0	15.0
V ₃ D ₂	1.0	14.6	89.5	15.0
V ₄ D ₁	1.3	15.1	107.0	15.0
V ₄ D ₂	1.3	15.1	72.3	15.0
V ₅ D ₁	1.3	15.8	110.0	15.0
V ₅ D ₂	1.0	15.6	105.3	15.0
SEm±	0.19	0.66	3.96	0.54
CD (P=0.05)	NS	1.52	8.13	NS
Interaction (V×D)				
SEm±	0.32	1.05	6.87	0.94
CD at 5%	NS	NS	14.08	NS

**Fig 1:** Effect of date of sowing and varieties on number of cob plant⁻¹, cob length (cm), cob weight plant⁻¹ (g) and number of row cob⁻¹ in Spring Maize**Table 2:** Effect of date of sowing and varieties on number of grains row⁻¹, grain weight cob⁻¹ (g), grain yield q ha⁻¹ and harvest index in Spring Maize

Treatments	Number of grains row ⁻¹	Grain weight cob ⁻¹ (g)	Grain yield q ha ⁻¹	Harvest index (%)
V ₁ D ₁	32.3	101.8	56.48	32.02
V ₁ D ₂	32.8	106.0	52.46	30.97
V ₂ D ₁	38.5	114.3	64.73	32.71
V ₂ D ₂	37.0	114.0	62.81	32.48
V ₃ D ₁	33.0	102.0	47.61	30.20
V ₃ D ₂	31.0	96.8	47.02	31.01
V ₄ D ₁	36.3	104.5	51.58	31.18
V ₄ D ₂	35.8	98.5	46.28	30.97
V ₅ D ₁	32.3	98.5	48.57	31.13
V ₅ D ₂	35.5	103.0	46.51	31.01
SEm±	1.48	2.62	1.02	0.23
CD (P=0.05)	3.71	6.59	2.08	0.46
Interaction (V×D)				
SEm±	2.56	4.54	1.76	0.39
CD at 5%	NS	NS	NS	0.80

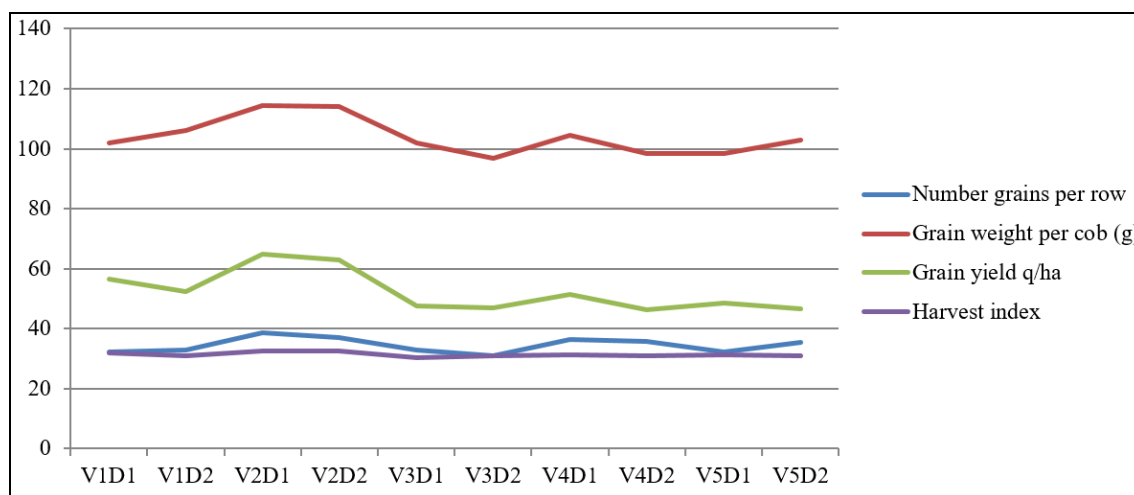


Fig 2: Effect of date of sowing and varieties on number of grains row⁻¹, grain weight cob⁻¹ (g), grain yield q ha⁻¹ and harvest index in *Spring Maize*

4. Conclusion

Variety 2 managed at the lower plant density (V₂D₁) emerged as the most productive treatment combination, achieving a statistically superior grain yield of 64.73 q ha⁻¹. This peak performance is directly attributed to its optimized yield components, including maximum cob length (16.6 cm), cob weight (137.0 g plant⁻¹), and grain weight per cob (114.3 g). While structural traits like cobs per plant and rows per cob are rigidly controlled by genetics and remained unaffected by management changes, transitioning to the higher plant density (D₂) created intense crowding stress that significantly reduced cob weights and grain yields across most varieties. Ultimately, Variety 2 demonstrated outstanding genetic resilience and nutrient-use efficiency, proving it to be the ideal choice for maximizing crop productivity under the (D₁).

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