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# Effect of hybrid varieties and seaweed extracts (SoliGro Gr) with nitrogen management on yield and economics of maize (*Zea mays* L.)

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### Abstract

A field experiment was conducted at the Student's Instructional Farm of Chandra Shekhar Azad University of Agriculture and Technology, Kanpur during the *kharif* season of 2018 and 2019 to evaluate the effect of different hybrid varieties and seaweed extract (SoliGro Gr) with nitrogen management on yield and economics of maize. The experiment was laid out in Factorial Randomized Block Design with two factors, one having three levels and the other having six levels, replicated thrice making eighteen treatment combinations assigned to 54 plots. The hybrid variety DKC-7074 produced significantly highest grain yield (36.31q/ha) including significantly higher gross return (Rs. 66644.25/ha), net return (Rs. 33147.75/ha) and benefit cost ratio (1.98). The application of SoliGro Gr with 125% N used in two split doses as basal and top dressing produced significantly highest grain yield (36.05 q/ha) including significantly higher gross return (Rs. 66274.83/ha), net return (Rs. 31964.83/ha) and benefit cost ratio (1.93). Therefore, in the case of interaction effect of the treatment combination DKC-7074 X SoliGro Gr with 125% N (basal + top dressing), significantly better grain yield, higher gross return, net return and benefit cost ratio was noted.

**Keywords:** Hybrid varieties of maize, seaweed extract, nitrogen management

### Introduction

Maize (*Zea mays* L.) is the chief emerging cereal crop ranking third in production after rice and wheat. Popularly known as queen of cereals, it is grown throughout the year but mainly as *kharif* crop in India with over an area of about 9.48 million hectare under its cultivation producing 26 million metric tons with an average productivity of 2.48 t ha<sup>-1</sup> (Anonymous, 2020) [1]. Still, India contributes merely about 2.5 per cent of global maize production. In India, hybrid maize constitutes more than 95 per cent of the total maize cultivation generating high-quality produce. Hybrids have comparatively better response to application of nitrogen and other organic nutrients. Even though, chemical fertilizers play crucial role in meeting the nutrient requirements of the crop but these in turn degrade the soil fertility by making it acidic, polluting environment, contaminating water basins, destroying beneficial soil micro flora and fauna and thereby making the crop more prone to diseases (Mishra *et al.*, 2013) [2]. Persistent nutrient depletion poses a greater threat to the sustainable agriculture. Therefore, there is an urgent need to reduce the usage of chemical fertilizers replacing it by the usage of organics which is needed to check the quality levels. However, use of organics alone does not lead to remarkable rise in crop yields due to their low nutrient status. Therefore, the aforementioned consequences have paved way to grow maize using organic manures along with inorganic fertilizers. Recent researches proved that seaweed fertilizers are preferred over other organic manures because of high amount of water soluble potash and phosphorus contents (Mondal, 2015) [3]. It has more than 70 minerals, vitamins and enzymes including a complete range of trace elements and amino acids which help in development of better roots thereby enhancing the nutrient uptake for better disease resistance, boosted up yields and improved protein content in the produce. There is strong need to incorporate such a kind of strategy featuring use of novel organic fertilizers such as seaweed in combination with nitrogenous fertilizer for obtaining higher yield of high yielding hybrid varieties in order to meet future food demands of India's ever increasing population.

## Materials and Methods

The present investigation was conducted in field no.12 at Student's Instructional Farm (SIF) of Chandra Shekhar Azad University of Agriculture and Technology, Kanpur, Uttar Pradesh, India, which is situated in the University campus at 26°29'35 North latitude and 80°18'25 East longitude. Elevation from mean sea level is 125.9 meter. The soil was medium in organic carbon, phosphorous and potash. The experiment was laid out in Factorial Randomized Block Design with two factors i.e. Factor A- Hybrid maize cultivars (having three levels) and Factor B- Seaweed extract@10kg/ha with Nitrogen % (having six levels), replicated thrice making eighteen treatment combinations viz., T<sub>1</sub> [Azad hybrid-3 + SoliGro Gr @10 kg/ha (Basal) + 100% Nitrogen], T<sub>2</sub> [Azad hybrid-3+ SoliGro Gr @10 kg/ha (Top dressing at 20 DAS) + 100% Nitrogen], T<sub>3</sub> [Azad hybrid-3 + SoliGro Gr @10 kg/ha (Basal & Top dressing) + 100% Nitrogen], T<sub>4</sub> [Azad hybrid-3+ SoliGro Gr@10 kg/ha (Basal) + 125% Nitrogen], T<sub>5</sub> [Azad hybrid-3 + SoliGro Gr @10 kg/ha (Top dressing at 20 DAS) + 125% Nitrogen], T<sub>6</sub> [Azad hybrid-3+SoliGro Gr.@10 kg/ha (Basal &Top dressing) + 125% Nitrogen], T<sub>7</sub> [DKC-7074+SoliGro Gr @10 kg/ha (Basal) + 100% Nitrogen], T<sub>8</sub> [DKC- 7074+SoliGro Gr @10 kg/ha (Topdressing at 20 DAS) + 100% Nitrogen], T<sub>9</sub> [DKC- 7074+SoliGro Gr @10 kg/ha (Basal & Top dressing) + 100% Nitrogen], T<sub>10</sub> [DKC-7074+ SoliGro Gr @10 kg/ha (Basal) + 125% Nitrogen], T<sub>11</sub> [DKC- 7074+ SoliGro Gr @10 kg/ha (Top dressing at 20 DAS) + 125% Nitrogen], T<sub>12</sub> [DKC-7074 + SoliGro Gr @10 kg/ha (Basal & Top dressing) + 125% Nitrogen], T<sub>13</sub> [Kaveri-218<sup>+</sup> + SoliGro Gr @10 kg/ha (Basal) + 100% Nitrogen], T<sub>14</sub> [Kaveri- 218<sup>+</sup> + SoliGro Gr @10 kg/ha (Topdressing at 20 DAS) + 100% Nitrogen], T<sub>15</sub> [Kaveri- 218<sup>+</sup> + SoliGro Gr @10 kg/ha (Basal &Top dressing) + 100% Nitrogen], T<sub>16</sub>

[Kaveri- 218<sup>+</sup> + SoliGro Gr @10 kg/ha (Basal) + 125% Nitrogen], T<sub>17</sub> [Kaveri- 218<sup>+</sup> + SoliGro Gr.@10 kg/ha (Top dressing at20 DAS) + 125% Nitrogen], T<sub>18</sub> [Kaveri- 218<sup>+</sup> + SoliGro Gr @10 kg/ha (Basal &Top dressing) + 125% Nitrogen].The crop was sown at a spacing of 60 × 25 cm during both the years of experimentation in III<sup>rd</sup> week of June and harvested in II<sup>nd</sup> week of October.

## Result and Discussion

### Effect of Hybrid varieties on yield and economics of maize crop

On the basis of pooled data analysis (Table 1), it was observed that the hybrid variety DKC-7074 produced significantly highest grain yield (36.31 q/ha) than the other tested hybrids. However, the lowest grain yield (29.30 q/ha) was produced by Azad hybrid-3. The grain yield per hectare is the final expression of physiological and metabolic activities of a plant and a product of cumulative action of all factors contributing to better growth viz. number of cobs per plant, grains per cob and test weight. The yield is a complex trait and exhibits continuous variation, such continuous variation being generally attributed to polygenic control. These results were collaborated with the findings of, Malik *et al.* (2009)<sup>[4]</sup> and Shobhana *et al.* (2012)<sup>[5]</sup>.

The pooled data (Table 1) result revealed that hybrid variety of DKC-7074 gave significantly higher gross return of Rs. 66644.25/ha, net return of Rs. 33147.75/ha and benefit cost ratio of 1.98 while Azad hybrid-3 gave the lowest gross return of Rs. 5387.92/ha, net return of Rs. 20144.75/ha and benefit cost ratio of 1.60. These effects might be associated with higher grain yields. The results are in close conformity with the findings of several workers, Jadhav and Shelke (2009)<sup>[6]</sup>, Pal and Bhatnagar (2012)<sup>[7]</sup> and Karim *et al.* (2010)<sup>[8]</sup>.

**Table 1:** Effect of Hybrid Varieties & Seaweed Extract (SoliGro Gr) with Nitrogen Management on Yield & Economics of Maize as pooled analysis (2018 & 2019)

Treatments	Grain Yield (q/ha)	Gross Return (Rs./ha)	Net return (Rs./ha)	B:C
<b>Hybrid Varieties</b>				
Azad -3	29.30	53807.92	20144.75	1.60
DKC 7074	36.31	66644.25	33147.75	1.99
Kaveri218+	33.49	62133.22	28081.17	1.83
SEd	0.404	254.382	315.162	0.015
CD at 5%	0.800	503.676	624.021	0.030
<b>Seaweed extract@10kg/ha with Nitrogen %</b>				
SoliGro with100% N Basal Dose	33.08	60870.67	27433.67	1.82
SoliGro with 100% N Topdressing	30.31	55914.83	23014.50	1.71
SoliGro with 100% N Basal+Top	34.39	62911.50	28952.50	1.85
SoliGro with 125% N Basal Dose	33.46	61284.17	27496.17	1.81
SoliGro with 125% N Topdressing	30.93	57914.78	23885.67	1.72
SoliGro with 125% N Basal+Top	36.05	66274.83	31964.83	1.93
SEd	0.571	254.382	445.707	0.021
CD at 5%	1.131	503.753	882.499	0.042

**Effect of SoliGro Gr with Nitrogen management on yield and economics of maize crop:** On the basis of pooled data analysis (Table 1), it was found that the application of SoliGro with 125% N basal + top dressing produced significantly highest grain yield (36.05 q/ha). However, the lowest grain yield (30.31 q /ha) was produced by the application of SoliGro with 100% N top dressing. The increased yield was due to better yield attributing parameters as well as better performance under increased level of nitrogen dose. These results were collaborated with the findings of Dilavarnaik *et al.* (2017)<sup>[9]</sup>, Basavaraja *et al.*

(2018)<sup>[10]</sup>, Yogendra (2018)<sup>[11]</sup> and Kumar *et al.* (2019)<sup>[12]</sup>. The pooled data (Table 1) result revealed that the application of SoliGro with 125% N basal + top dressing gave significantly higher gross return of Rs. 66274.83/ ha, net return of Rs. 31964.83/ha and benefit cost ratio of 1.93 while the application of SoliGro with 100% N top dressing gave the lowest gross return of Rs. 55914.83/ha, net return of Rs. 23014.50/ha and benefit cost ratio of 1.71. These effects might be associated with higher grain and stover yields. The results are in close conformity with the findings of, Pal *et al.* (2015)<sup>[13]</sup>, Colla *et al.* (2017)<sup>[14]</sup>, and Yao *et al.* (2020)<sup>[15]</sup>.

## Conclusion

From the results, it could be concluded that the hybrid variety DKC-7074 not only recorded significantly higher grain yield, stover yield and harvest index % but also gave maximum gross return, net return and return per rupee as compared to other maize hybrid cultivars along with the application of SoliGro with 125% N (basal+ top dressing) as compared to rest treatments in the pooled analyzed data.

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