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Research Communication

Dry-matter accumulation of sweet corn (*Zea mays*) under variable seedling age and integrated nutrient supply

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ABSTRACT

An experiment was conducted during the rainy (*Kharif*) season of 2020 at Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Wadura Sopore, Jammu and Kashmir to evaluate the effect of age of seedling and sources of nutrients on dry-matter production of sweet corn (*Zea mays* L.). It was laid out in randomized complete-block design with factorial arrangement, replicated thrice. The age of seedling comprised of 12, 22 and 32 days old seedlings and sources of nutrients consisted of control, 100% recommended dose of fertilizer (RDF), 50% RDF + FYM @ 12 t/ha, 50% RDF + vermicompost @ 4 t/ha and 50% RDF + poultry manure @ 2 t/ha. The findings of this study indicated that, age of seedling and sources of nutrients had a significant influence on dry-matter accumulation. Transplanting of 32 days old seedlings recorded significantly higher values for dry-matter accumulation up to 30 days after transplanting, but thereafter transplanting 22 days old seedlings was found superior up to the harvesting. With respect to sources of nutrients application of 50% RDF + poultry manure @ 2 t/ha registering significantly higher dry-matter accumulation.

Key word: Crop-growth rate, Dry-matter, Relative growth rate, Seedling age, Sweet corn, Transplanting

Reduced stand uniformity results in heterogeneous ear maturity and decreased yield and value of sweet corn (*Zea mays* L.). Badran (2001) advocated that, transplanting maize under late-sowing conditions, might be a viable alternative to direct sowing. Transplanting maize helps farmers to accommodate more than one crop in a year, as the growth period of maize was found to be reduced by 8 to 10 days by transplanting (Basu and Sharma, 2003). Transplanting advantages in number of ways which include optimum use of seed and space, reduce the risk associated with early vegetative growth at slow-rate, ensures uniform crop-stand which eventually leads to more uniform flowering and enhanced yields. Transplanting technology is competent if a suitable age of transplant is chosen (Kumar *et al.,* 2014) and appropriate age of seedlings positively influences crop growth, yield and quality (Okunola, 2009). It is apparent that with the soil-nutrient depletion either in the form of nutrients losses or plant consumption, a huge demand is generated for nutrient replenishment and fertilizers are used to replenish the nutrient loss. Agronomic interest in use of organic sources of nutrients is a healthy attempt for the maintenance of soil health and gives a boost to the crop production. Addition of organic manures exerts an appreciable influence on physico-chemical as well as biological properties of production. However, to meet the country's requirement of foodgrains and other agricultural commodities needed for projected population, the available organic sources of nutrients such as animal waste, crop residue, and household waste are not enough to fulfil the demand. Hence, an experiment was conducted to study the effect of seedling age and sources of integrated nutrient supply on dry-matter accumulation in sweet corn.

The experiment was conducted during the rainy (*kharif*) season of 2020 at Sher-e-Kashmir University of Agricultural Sciences and Technology-Kashmir, Wadura Sopore, Jammu and Kashmir. The experiment consisted of 2 factors with 3 levels of factor A–age of seedlings and 5 levels of factor B– sources of nutrients. Age of seedlings consisted of A_1, 12 days old seedlings; A_2, 22 days old seedlings; and A_3, 32 days old seedlings. The seedlings were raised in

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polybags under protected conditions. Sources of nutrients consisted of F_0, control; F_1, recommended dose of fertilizer (RDF); F_2, ½ RDF + 12 t/ha FYM; F_3, ½ RDF + 4 t/ha vermicompost; and F_4, ½ RDF + 2 t/ha poultry manure. Organic sources of nutrient were applied to soil 15 days before transplanting the seedlings to main field, whereas inorganic sources were applied at the time of transplanting. The design of experiment was randomized complete block with factorial arrangement consisting of 3 replications.

The results indicated that, significantly maximum dry-matter accumulation (11.84 t/ha) was obtained by transplanting 22 days old seedlings, followed by 12 days old seedlings (10.79 t/ha), whereas the lowest by transplanting 32 days old seedlings (10.00 t/ha) which was possibly due to a greater leaf-area index (LAI) and root volume noted under younger seedlings (Table 1). This ultimately enhanced the photosynthetic activity of sweet corn that led to proper development of sink which was noticed in terms of dry-matter production by the sweet corn. No significant influence was observed on crop-growth rate (CGR) and relative growth rate (RGR) due to age of seedlings (Tables 2, 3). However, numerically higher crop-growth rate was observed with transplanting A_2 seedlings (22 days old) from 45 to 60 days after transplanting up to harvesting. The maximum CGR (33.87 g/m^2/day) was observed with transplanting A_2 seedlings (22 days old), followed by transplanting A_1 seedlings (12 days old) with CGR of 32.51 g/m^2/day at 60 to 75 days after transplanting. Relative growth rate showed increasing trend up to 45 days after transplanting, thereafter decline in the trend was noticed as shown in Table 3. Numerically, maximum RGR value (0.076 g/g/day) was noted during 30–45 days after transplanting interval with A_2 seedlings (22 days old). The results are in agreement with the findings of Biswas (2008).

Among various treatments of nutrient sources, treatment F_4 (½ RDF + 2 t/ha poultry manure) recorded statistically higher dry-matter accumulation (12.82 t/ha), followed by treatment F_1 (RDF). The lowest dry-matter accumulation (8.33 t/ha) was observed in the control treatment. The marked difference in growth parameters under different sources of nutrients can be attributed to the better utilization of nutrients during the crop-growth period under phased release of nutrients. Ekta *et al.,* (2013); Bhatt *et al.* (2020) and Walia and Abhishek (2021) reported similar trend. While considering nutrient sources, application of F_4 (½ RDF + 2 t/ha poultry manure) registered higher values for crop-growth rate with no significant difference. The CGR of maximum value (36.68 g/m^2/day) was recorded under the treatment F_4 (½ RDF + 2 t/ha poultry manure) which was followed by treatment F_1 (RDF) with CGR of 33.88 g/m^2/day during 60–75 days after transplanting interval. The maximum RGR (0.065 g/g/day) was recorded under the treatment F_4 (½ RDF + 2 t/ha poultry manure) during 45–60 days after transplanting interval. Similar results were reported by Bhatt *et al.,* (2020) and Kalyanasundaram and Augustine (2021).

It may be concluded that, seedlings of too lesser age are not able to express their potential to fullest and transplanting of too aged seedlings also are not able to show enhanced performance. Therefore, for high crop growth and dry-matter production, transplanting of sweet corn at optimum seedling age is a prerequisite. Similarly, plots applied with treatment F_4 (½ RDF + 2 t/ha poultry manure) per-

Table 1. Dry-matter accumulation in sweet corn as influenced by seedling age and nutrient sources

Treatment	Dry-matter accumulation (t/ha)						
	15 DAT	30 DAT	45 DAT	60 DAT	75 DAT	90 DAT	At harvest
Age of seedling (days)							
A_1, 12	0.34	0.56	1.77	4.55	9.43	10.56	10.79
A_2, 22	0.54	0.84	1.98	4.91	9.99	11.59	11.84
A_3, 32	0.69	0.98	1.64	3.94	8.50	9.75	10.00
SEm±	0.01	0.03	0.04	0.12	0.18	0.26	0.29
CD (P=0.05)	0.04	0.10	0.13	0.33	0.52	0.75	0.83
Sources of nutrients							
F_0, Control	0.47	0.67	1.53	3.26	6.96	8.03	8.33
F_1, RDF	0.54	0.83	1.92	4.98	10.06	11.60	11.77
F_2, ½ RDF + 12 t/ha FYM	0.50	0.73	1.69	4.15	9.05	10.32	10.55
F_3, ½ RDF + 4 t/ha VC	0.51	0.76	1.73	4.34	9.36	10.66	10.90
F_4, ½ RDF + 2 t/ha PM	0.60	0.97	2.10	5.60	11.10	12.58	12.82
SEm±	0.02	0.04	0.06	0.15	0.23	0.33	0.37
CD (P=0.05)	0.05	0.13	0.16	0.43	0.67	0.97	1.07

DAT, Days after transplanting; RDF, recommended dose of fertilizer; FYM, farmyard manure; VC, vermicompost; PM, poultry manure

Table 2. Influence of seedling age and nutrient sources on crop-growth rate of sweet corn

Treatment	Crop growth rate (g/m²/day)					
	15–30 DAT	30–45 DAT	45–60 DAT	60–75 DAT	75–90 DAT	90–105 DAT
Age of seedling (days)						
A_1, 12	1.44	8.03	18.58	32.51	7.64	1.40
A_2, 22	2.03	7.54	19.56	33.87	10.66	1.59
A_3, 32	1.88	4.42	15.31	30.41	8.34	1.62
SEm±	0.26	0.38	0.81	1.38	1.26	0.32
CD (P=0.05)	NS	1.11	2.36	NS	NS	NS
Sources of nutrients						
F_0, Control	1.29	5.72	11.57	24.68	7.13	1.97
F_1, RDF	1.94	7.26	20.37	33.88	10.26	1.16
F_2, ½ RDF + 12 t/ha FYM	1.54	6.34	16.44	32.64	8.49	1.53
F_3, ½ RDF + 4 t/ha VC	1.68	6.48	17.38	33.45	8.67	1.51
F_4, ½ RDF + 2 t/ha PM	2.46	7.52	23.34	36.68	9.87	1.51
SEm±	0.34	0.49	1.05	1.78	1.63	0.41
CD (P=0.05)	NS	NS	3.05	5.15	NS	NS

DAT, Days after transplanting; RDF, recommended dose of fertilizer; FYM, farmyard manure; VC, vermicompost; PM, poultry manure

Table 3. Relative growth rate of sweet corn as influenced by seedling age and nutrient sources

Treatment	Relative growth rate (g/g/day)					
	15–30 DAT	30–45 DAT	45–60 DAT	60–75 DAT	75–90 DAT	90–105 DAT
Age of seedling (days)						
A_1, 12	0.033	0.076	0.063	0.049	0.008	0.0013
A_2, 22	0.030	0.057	0.061	0.047	0.010	0.0014
A_3, 32	0.023	0.035	0.058	0.051	0.009	0.0017
SEm±	0.0035	0.0035	0.0026	0.0023	0.0013	0.0016
CD (P=0.05)	NS	0.01	NS	NS	NS	NS
Sources of nutrients						
F_0, Control	0.0228	0.055	0.051	0.051	0.010	0.002
F_1, RDF	0.0286	0.056	0.063	0.047	0.010	0.001
F_2, ½ RDF + 12 t/ha FYM	0.0252	0.056	0.060	0.052	0.009	0.002
F_3, ½ RDF + 4 t/ha VC	0.027	0.055	0.061	0.051	0.009	0.002
F_4, ½ RDF + 2 t/ha PM	0.032	0.051	0.065	0.046	0.008	0.001
SEm±	0.005	0.005	0.003	0.003	0.002	0.002
CD (P=0.05)	NS	NS	0.0097	NS	NS	NS

DAT, Days after transplanting; RDF, recommended dose of fertilizer; FYM, farmyard manure; VC, vermicompost; PM, poultry manure

formed statistically better than the other treatments in terms of dry-matter accumulation in sweet corn.

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