



Research Article

FERTIGATION LEVEL AND MULCHING IN CAULIFLOWER (*Brassica oleracea* L. var. *botrytis*) cv. SNOWBALL WHITE

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Abstract- A field experiment was carried out at Experimental farm, Department of Horticulture, Assam agricultural University during 2012-13 to evaluate three individual levels of drip and fertigation of nitrogen and potash with or without bi-layer polyethylene mulch in cauliflower. Significantly the highest curd yield of 706.33 g/plant (282.53 q/ha) was obtained with 100% supplementation of OPE through drip @ 24.96 liter/plant and fertigation of nitrogen and potash @ 125% of recommended dose/ha i.e. 100 kg N & 60 kg P₂O₅ and K₂O with a crop duration of 61.67 days and B:C of 0.89. The plant height, days to fifty per cent curd initiation, days to horticultural maturity, curd weight, curd yield, shoot and root ratio, were significantly influenced by drip and fertigation level and mulching. The shelf life of curd was significantly more at mulched conditions. The same treatment combination without mulch gave an yield of 248.53 q/ha with B:C of 1.96.

Keywords- Cauliflower, Open pan evaporation (OPE), Drip irrigation, Fertigation, Mulching.

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Introduction

Cauliflower (*Brassica oleracea* L. var. *botrytis*) is nutritious, delicious and important vegetable crop [1]. It was believed to be most important crop among the 'cole crops' to involve from wild cabbage and was cultivated by Romans [2]. Cauliflower is used as cooked vegetable in India either singly or in combination with other vegetables, especially with potato and peas etc. It is also relished in curry and sambhar and often used in pickles along with carrot. Recently, the froze cauliflower is also available in Indian market.

Drip irrigation was found efficient with higher marketable yield of broccoli as compared to other conventional methods of irrigation [3]. Cauliflower with drip irrigation, fertigation and mulching is lacking information in North East India, where the cropping period suffers from acute shortage of water during rabi reason. Higher yield with drip irrigation, fertigation and mulching has been reported in many vegetable crops. Quantification of fertigation with poly-film mulch is a need of the present and forthcoming situations.

Materials and Methods

The field experiment was carried out during 2012-2013 rabi (Oct-Dec.) season at Experimental farm of Department of Horticulture, Assam agricultural University (96.8 m MSL, 26°47'N and 94°12'E) on sandy loam soil. The soil of the experimental site was (pH 4.80, OC 0.48%, available N 261.0 (L) available P₂O₅ 37(M) and available K₂O 126.36 (M)). The treatments consisted of three levels of drip irrigation (100%, 75% and 50% OPE), three levels of fertigation (125%, 100% and 75% recommended dose of fertilizer) with or without 30 micron bi-layer polyethylene mulch. The highest daily OPE was taken as 2mm from past ten years meteorological data. The temperature, humidity, rainfall and daily mean evaporation data during the crop growth period are presented in [Fig-1]. The

recommended dose of fertilizer was 80:60:60 N:P₂O₅:K₂O kg/ha and supplied in the form of Urea, SSP and MOP injected through Ventury system. 25 days old seedlings of Snowball white F1 were planted in the field at a spacing of 50cm x 50 cm (40,000 plants/ha) Net individual plot size was 5.25 m². The treatments were replicated three times as Randomized Block Design. The treatments were:

Treatments	With polyethylene mulch
T1	100% OPE, 125% RD of N & K
T2	100% OPE, 100% RD of N & K
T3	100% OPE, 75% RD of N & K
T4	75% OPE, 125% RD of N & K
T5	75% OPE, 100% RD of N & K
T6	75% OPE, 75% RD of N & K
T7	50% OPE, 125% RD of N & K
T8	50% OPE, 100% RD of N & K
T9	50% OPE, 75% RD of N & K
	Without polyethylene mulch
T10	100% OPE, 125% RD of N & K
T11	100% OPE, 100% RD of N & K
T12	100% OPE, 75% RD of N & K
T13	75% OPE, 125% RD of N & K
T14	75% OPE, 100% RD of N & K
T15	75% OPE, 75% RD of N & K
T16	50% OPE, 125% RD of N & K
T17	50% OPE, 100% RD of N & K
T18	50% OPE, 75% RD of N & K

Results and Discussion

Growth and yield parameters

Plant height [Table-1]: Drip level at 100% OPE with mulch and N&K fertigation at

125%, 100% or 75% of RD resulted into maximum plant height (38.67, 38.33, and 37.33cm) against the lowest plant height of 32.33cm in drip level of 50% OPE at three levels of fertigation without mulch. The contrasting results of mulch were clearly evidenced by the present investigation. Treatment T₇, T₈, T₉, T₁₆, T₁₇ and T₁₈ which were provided with 50% OPE water along with 75% of N and K irrespective of mulch resulted into significantly lowest plant height, while, all other remaining treatments recorded superior and closely followed results in respect of height. The overall impact of full dose of fertilizer and 100% OPE increased the plant height in T₁ and T₁₀ leading to the highest cauliflower curd weight, diameter and maximum moisture content of curd.[4] revealed that different level of irrigation and fertigation on brinjal with drip irrigation at 75% of PE with fertigation of 75% of recommended N and K produced maximum shoot length and more number of branches.

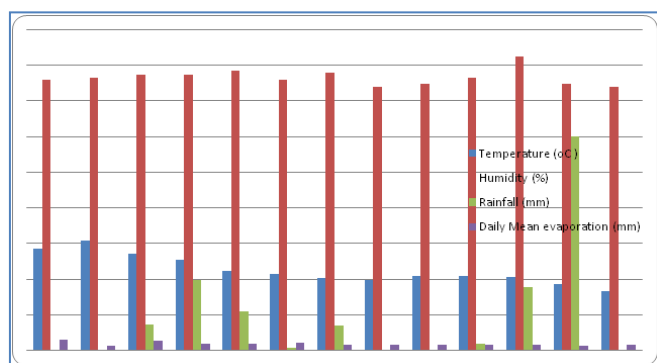


Fig-1 Temperature, Humidity, Rainfall and Daily Mean evaporation during crop growth period

Leaf number [Table-1]: The leaves number revealed that the lowest leaves were recorded in both 75% and 50% OPE along with any level of fertigation of N&K of RD without mulching. The highest number of leaves (18.00) was recorded under T₁ to T₉ could be attributed to the optimal use of moisture through conservation by mulch. [5] found significant effect of different levels of fertigation irrespective of mulch on number of leaves of okra. Days to 50% curd initiation and horticultural maturity [Table-1]: The number of days for fifty per cent curd initiation and total number of days required for horticultural maturity of curd showed that drip level at 100% and 75% OPE with 100% and 75% RD of N&K under mulched took significantly more days (35.33 and 63.33 days). Data on days to curd initiation revealed that, there was a significant difference due to fertigation irrespective of mulch. The lowest days to curd initiation of 29.00 days was recorded at 50% OPE and 75% RD of N & K with mulch which might be attributed to low level of drip

and low N and K level without mulch. T₁, T₂ and T₁₀, T₁₁ having 100% OPE and 125% RD of N & K irrespective of mulch, took more days to maturity leading to conclude the beneficial effect of more moisture, more nutrients resulting in more vegetative growth and thus slight delay in curd manifestation. [6] found that the yield and keeping quality of early potato, cabbage and other vegetables improved by mulch. Curd diameter, curd weight and curd yield [Table-1]: Curd diameter was significant under mulch with 75% and 100% OPE with all levels of N&K fertigation (12.33 cm to 14.00 cm). The individual curd weight and curd yield per hectare were significantly the highest in 100% OPE along with 125% RD of N&K fertigation under mulched condition (706.33g) which was followed by similar level of drip level with mulch and 100% RD of N&K and 75% RD of N&K (677.87g and 674.00g), respectively. The lowest curd yield of 451.57g was recorded at the lowest level of drip and fertigation without mulch. The maximum curd yield per hectare was recorded as 282.53 q/ha and the lowest was 180.67 q/ha. [7] Opined the drip irrigation proved to be efficient for providing irrigation water and nutrient to the roots of plants along with maintaining high yield potential. Shoot root ratio [Table-1]: The shoot root ratio found to be within the range of 53.01 to 75.23. The shoot root ratio was a reflection on the part of physiological growth rate. The higher range indicated the advantageous conditions of mulch leading to more yield. [Fig-2] shows the yield (q/ha) of cauliflower in different treatment. The water requirement was maximum in 100% OPE, 125% N&K of RD and mulching (1199 m³/ha i.e., 24.96 liter/plant) which was equal to 100% OPE and RD of N&K and without mulch (551 m³/ha).

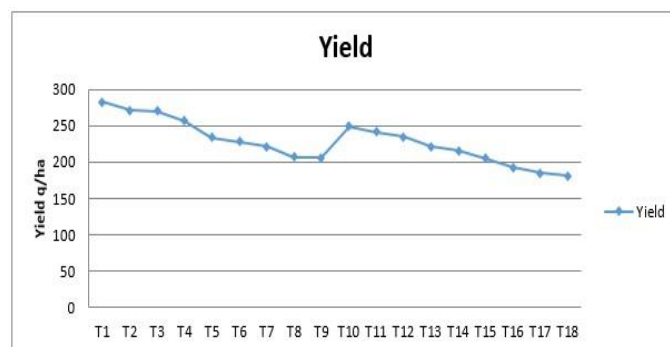


Fig-2 Yield of cauliflower (*Brassica oleracea L. var. botrytis*) cv. Snowball White as affected by different level of drip, fertigation, mulch and without mulching (q/ha)

Table-1 Cauliflower plant parameters as influenced by levels of drip irrigation, fertigation with or without mulch

Treatments	Plant Height (cm)	No. of Leaves	Days to 50% Curd initiation	Curd Diameter (cm)	Curd Weight (g)	Shoot root ratio	Yield (q/ha)	Days to 25% Physiological weight loss	B:C*
T ₁	38.33	18.00	35.33	13.33	706.33	53.01	282.53	7.00	0.89
T ₂	37.67	18.00	33.33	13.67	677.87	56.52	271.15	6.00	0.81
T ₃	37.33	18.00	32.60	14.00	674.00	64.74	269.60	6.33	0.81
T ₄	37.33	17.33	31.67	13.33	641.00	63.74	256.40	6.00	0.71
T ₅	37.00	18.00	31.33	14.00	583.33	62.48	233.33	6.00	0.56
T ₆	37.00	17.37	31.33	13.33	570.67	64.04	228.13	6.00	0.53
T ₇	35.33	18.00	29.33	13.33	552.33	56.15	221.07	6.33	0.48
T ₈	35.00	18.67	29.00	11.67	516.33	56.28	206.53	6.33	0.38
T ₉	34.67	18.00	29.33	11.33	515.33	56.80	206.13	5.67	0.39
T ₁₀	37.33	17.67	35.33	13.00	621.33	70.50	248.53	5.00	1.96
T ₁₁	36.00	17.33	33.33	12.33	601.33	70.17	241.07	5.00	1.88
T ₁₂	36.00	17.33	32.67	12.33	585.33	72.07	234.13	4.67	1.82
T ₁₃	35.67	16.67	31.67	12.00	553.33	69.55	221.33	4.67	1.64
T ₁₄	36.00	16.33	31.33	11.33	539.67	69.10	215.7	5.00	1.58
T ₁₅	34.33	16.67	31.33	12.00	513.33	67.35	205.33	5.00	1.47
T ₁₆	32.33	16.33	29.33	10.67	480.67	68.32	192.27	5.00	1.30
T ₁₇	32.33	16.00	29.33	10.33	462.67	71.72	185.07	5.00	1.21
T ₁₈	32.33	16.00	29.33	10.33	451.67	75.23	180.67	5.00	1.18
S.Ed(±)	0.82	0.92	1.02	0.88	1.13	0.17	0.83	0.88	-
CD(5%)	1.66	1.88	2.09	1.79	2.29	0.53	2.12	1.78	-

*Selling rate of cauliflower = Rs. 15.00 per kg

Quality parameter

Curd moisture content [Table-2]: The moisture content of curd at harvest showed significant and a descending trend along with decrease in level of drips irrespective of mulch condition. Drip at 100% OPE along with 125% and 100% RD of N&K under mulching exhibited the maximum value and the least was recorded in 50% OPE along with 75% RD of N&K without mulch. The highest curd moisture content of 51.62% recorded with 100% OPE, 125% RD of N and K with mulch which could be attributed to a high level of water supply and moisture conservation due to mulch.

Table-2 Moisture content, horticultural maturity and water requirement as influenced by levels of drip irrigation, fertigation with or without mulch

Treatments	Moisture content (%)	Days to Horticultural maturity	Water requirement (m ³ /ha)
T ₁	51.62	62.67	1199
T ₂	51.15	61.67	1118
T ₃	50.59	60.33	1153
T ₄	50.24	62.00	888
T ₅	49.61	62.00	888
T ₆	49.31	63.33	907
T ₇	50.44	62.33	596
T ₈	49.50	62.00	593
T ₉	48.48	62.33	594
T ₁₀	49.71	60.33	1153
T ₁₁	48.08	60.00	1147
T ₁₂	47.86	60.67	1160
T ₁₃	46.12	60.00	859
T ₁₄	45.97	60.00	859
T ₁₅	47.41	60.33	864
T ₁₆	47.51	59.33	849
T ₁₇	42.51	58.67	561
T ₁₈	42.03	57.67	551
S.E.d(±)	0.15	0.82	-
CD(5%)	0.30	1.66	-

Cost Economics

Cost economics [Table-1]: The benefit cost analysis indicated that the cost of cultivation increased considerably with polythene mulch. Though it is established earlier in many crops and proved in present investigation too that mulch can increase yield considerably; however, the increase in cost due to mulch could not be compensated by a proportionate increase in yield. Since the same drip (100% OPE) and fertigation (125% RD of N&K) with mulch gave B:C of 0.89 against B:C of 1.96 without mulch. [8] showed that the increase in NPK fertigation level from 33.3 to 100% RDF significantly increased number of leaves, relative leaf water content, marketable yield of cauliflower and benefit cost ratio but decrease in fertilizer expense efficiency.

Conclusion

It was concluded that cauliflower cultivation with a total volume of 1153.38 m³/ha water could be applied through fertigation of 100 kg N and 75 kg K₂O/ha, through maintenance of basal dose of 60 kg P₂O₅ with an average yield of 248.53 q/ha and economic return of Rs. 1.96 per rupee at a crop period of 60 days under Jorhat, Assam situation.

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Conflict of Interest: None declared

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