Different Sowing Media and Variety Affecting Physiological Performance of Early Cauliflower and Correlation Studies of Curd Yield with Physiological Parameters

ABSTRACT

An experiment was conducted during 2018 and 2019 at the Experimental Farm, Department of Horticulture, College of Agriculture, Assam Agricultural University, Jorhat and at Farmer's field to assess the physiological performance of early cauliflower varieties in different sowing media and to evaluate their performance in the field as well as to study the correlation of different physiological parameters with curd yield. The experiment was laid out in Randomized Block Design with eight treatments comprising of four sowing media [M_1-cocopeat (60): vermiculite (20): perlite (20), M_2-cocopeat (50): vermicompost (50),M_3-cocopeat (50): vermicompost (50): microbial consortium@1:100 and M_4-Conventional nursery]and two varieties [V_1 (White Diamond) and V_2 (CFL1522)] replicated thrice.The results revealed that growing medium had significant influence on different physiological parameters of early cauliflower seedling. Maximum chlorophyll content was recorded in M_3 (0.98 mg g^{-1}fw), maximum number of stomata in upper and lower surface (83.47and 150.97), relative water content (90.06 %) and dry matter accumulation (11.41 %) were recorded in M_2. Between the two varieties, V_1 recorded higher stomata number (145.06) in the lower surface. In the main field, the plants grown from M_3 showcased superior performance with highest relative water content (93.62%),chlorophyll content at 30 days after transplanting (1.40 mg g^{-1}fw) and at harvest (2.16 mg g^{-1}fw), membrane stability index (65.32%) and minimum lipid peroxidation (0.85 n mol g^{-1}fw) at harvest.Between the two varieties White Diamond(V_1) recorded the higher relative water content (89.48 %) while V_2 (CFL 1522) recorded the maximum membrane stability index (55.10%).Correlation coefficient analysis indicated chlorophyll content at seedling stage, crop growth and at harvest stage, relative leaf water content and membrane stability index at harvest have positive and significant correlation with curd yield of cauliflower. The study indicates sowing media had significant influence on physiological parameters of seedlings of early cauliflower which is again reflected in the field condition.

Key words: Media, variety, nursery, field, physiological, correlation, early cauliflower

1.INTRODUCTION

Cauliflower (*Brassica oleracea L.* var. *botrytis*),one of the most important winter season vegetables of India belongs to family Brassicaceae and is popular for its white tender head or curd. Cauliflower plays an important role in the human diet due to its attractive appearance, good taste and rich nutritive value. It is a rich source of protein, carbohydrates, vitamin-B and C as well as various minerals which are necessary for the human health. The edible flowering heads are used as fried vegetable, dried vegetable, for making soups, and pickles.

The major cauliflower producing states are Bihar, Uttar Pradesh, Orissa, West Bengal, Assam, Haryana and Maharashtra. During 2017-18, the area under cauliflower in India was 452.60 thousand ha with a production 8668.2 thousand metric tons & productivity of 19.2 metric ton/ha. Assam has an area of 22.93 thousand hectare and production of 418.69 thousand metric tons (Horticultural Statistics at a glance,2018).

In Assam, early Cauliflower is sown during mid-July to first week of August which matures by the month of October. This crop provides the farmers with a substantial return as it is available in market early in the season during October.

In recent use of seedling grown in different growing medium in plug trays becoming very popular as seedling produced in conventional medium cause stress in plants. The use of suitable growing media or substrates for sowing of seeds directly affects the germination, development of functional shoot and root system. A good growing medium provides sufficient anchorage or support to the plant, serves as reservoir for nutrients and water, allow oxygen diffusion to the roots and permit gaseous exchange between the roots and atmosphere outside the root substrate [1]. The quality of seedlings is very much influenced by growing media under nursery [2]. Seedlings obtained from a quality nursery significantly influences re-establishment and the eventual productivity in the main field [3].

The purpose of a good potting medium is to enable healthy and vigorous and healthy seedling growth within the limited space of the container and to prepare seedling for successful transplanting in the field. The potting medium support growing seedlings physically, and stores and supply nutrients, water and air to the root system. Successful greenhouse and nursery production of container grown plants are largely dependent on the physical and chemical properties of growing media. To avoid the challenges of conventional growing medium farmers and nurseryman are now adopting alternative growing media like vermicompost, cocopeat, vermiculite, perlite or their combination so as to make it more porous and enrich with adequate nutrients for the seedlings. Essentially perlite and vermiculite are used in the horticultural industry because they both provide good aeration and drainage, they can retain and hold substantial amount of water, ree from diseases, having a fairly neutral pH (especially perlite which is neutral), non-toxic, safe to use, and relatively inexpensive.

Cocopeat, an agricultural by-product of the coconut husk is considered a growing medium component with acceptable pH, EC and other chemical attributes [1] as it has good physical properties, high total pore space, high water content, low shrinkage, low bulk density and slow biodegradation, significant amount of phosphorous(6-60 ppm) and potassium (170-600 ppm) and can hold water up to nine times its weight.

Vermicomposting is a promising method of transforming unwanted and virtually unlimited supplies of organic wastes into usable substrates having good structure, moisture-holding capacity, relatively large amounts of available nutrients, and microbial metabolites that may act as plant growth regulators.

A quality transplant has the criteria of uniformity, stockiness, adaptability, early maturity in the field, and overall health. Soil provides natural support to plant, sand provides proper aeration in media, cocopeat and vermiculite gives warm conditions, high water holding capacity and vermicompost as a source of organic manure provides better nutrition to the germinating seedlings.

A pre-sowing inoculation of planting material as well as the planting medium with the microbial consortia is an innovative approach for production of quality and healthy seedlings of vegetables. A microbial consortium is a carrier based product containing nitrogen fixing, phosphorus and potassium solubilizing and plant growth promoting microorganisms in a single formulation augmenting in producing healthy and vigorous seedlings and considerably reducing the cost of cultivation by reducing fertilizer requirement of vegetables. As there is knowledge gap regarding the effect of growing medium on physiological parameters of seedlings of early cauliflower and further their performance in field with respect to these parameters the present investigation was formulated.

2. MATERIALS AND METHODS

The experimental site was conducted in the Experimental Farm, Department of Horticulture, Assam Agricultural University, Jorhat (26.47 °N latitude and 94.12 °E longitude and at 86.8 m above MSL) during the month of July-November in two consecutive years, 2018 and 2019.The soil was sandy loam soil having p^{H} 5.00, organic carbon 0.55% and available N, P and K were 212.52 kg ha^{-1}, 40.45 kg ha^{-1} and 110.64 kg ha^{-1}.The experiment composed of four Nursery Media composition[M_1- Cocopeat (60): Vermiculite (20): Perlite (20); M_2-Cocopeat (50): Vermicompost (50); M_3-Cocopeat (50): Vermicompost (50): Microbial consortium and M_4: Conventional nursery (soil: sand: FYM)] and two variety (V_1- White Diamond and V_2 - CFL 1522). Thus, 8 treatment combinations were laid out in two factor factorial Randomized block design (RBD) with three replications. The portrays/plug trays were used for nursery raising with cocopeat, vermiculite, perlite, vermicompost and microbial consortium as growing media and seeds of early cauliflower hybrid variety 'White Diamond' and 'CFL-1522' were sown in protrays (one seed per cell) under protected conditions (V-Type nursery) in the second week of July. One conventional nursery was also raised for sowing same seeds with soil, sand and FYM as growing media. Microbial Consortium consisting of *Azotobacter*, *Azoospirullum* and Phosphate Solubilising Bacteria (PSB) was mixed with respective media at a ratio of 1:100 and mixed properly and sprinkled and heaped. Coco peat was soaked and washed before mixing with other media. Recommended package of practice was followed for cultivation of the crop. Healthy seedlings of 22-28 days old were selected and transplanted on 2nd week of August at a spacing of 45 cm x 45 cm. Different Physiological parameters of seedling and plants were taken with the following formulae and procedure.

2.1 Dry matter accumulation (%)

Calculated by using the formula

$$= \frac{\text{Dry weight}}{\text{Fresh weight}} \times 100$$

2.2 Relative leaf water content (%)

For estimation uppermost fully expanded fresh leaf of seedlings was collected at 10 am to study the water content parameters. Twenty discs were taken from the leaves of each treatment and weighed. Leaf discs were submerged in water in a petri dish for four hours. They were blotted and their saturated weight was measured. Discs were dried at 80 °C till a constant weight was observed. RLWC was calculated by the following equation and was expressed as percentage.

$$\text{RLWC} = \frac{DW - SW}{DW - FW} \times 100$$

Where, FW = Fresh weight of the leaf discs (g)
SW = Saturated weight of the leaf discs (g)
DW = Dry weight of the leaf discs (g)

2.3 Total Chlorophyll content (mg g^{-1}fw)

Estimation was done from fresh leaf samples. The absorbance of the extract was measured at 645 and 663 nm wavelength filters in UVV spectrophotometer as per the method developed by Anderson and Boardman (1964) as below:

$$\text{Total chlorophyll in mg/g tissue} = \frac{20.2 \times (D.645) + 8.02 \times (D.663) \times V}{1000 \times W}$$

Where, V = Final volume of extract (ml)

W =Weight of sample taken (g)

D.645 = O.D. at 645

D.663 = O.D. at 663

2.4 Stomata number

Stomata number is the average number of stomata per square millimeter of epidermis. For determination of stomata number a piece of leaf was cleaned and peeled out by means of forceps. It was kept on slide and mounted in glycerine water. Camera lucida was attached and drawing board was placed for drawing the cells. A square of 1 mm by means of stage micrometer was drawn on it. The slide with cleared, leaf was placed on the stage and the epidermal cells and stomata were traced. The number of stomata in each field was counted.

2.5 Membrane stability index

A fully expanded young leaf at harvesting stage was selected from each treatment before irrigation. Ten leaf pieces (2 cm) were cut from these leaves and washed with distilled water to remove the debris from the tissue. The leaf segments were put into glass bottles and 20 ml distilled water was added. Prepared bottles were left in shaker for 24 h and after this procedure solutions in bottles were transferred into test tubes and C1 value was measured in Electrical conductivity meters. Solutions were again transferred into bottles and put in autoclave at 120 °C for 20 minute. Afterwards C2 value was measured in room temperature. Membrane stability index percentage was calculated by the following equation proposed by [4].

$$\text{MSI} = 1 - \frac{EC1}{EC2} \times 100$$

2.6 Lipid peroxidation

Estimated at harvest stage. The level of lipid peroxidation was measured in terms of Malondialdehyde content (MDA), a product of lipid peroxidation using reagents Trichloroacetic acid (0.1%) and Thiobarbituric acid (0.5 %). Leaf sample of 0.5 g fresh leaf was homogenized in 10 ml 0.1 percent trichloroacetic acid (TCA). The homogenate was centrifuged at 15,000 rpm for 5 minutes. Two ml of aliquot of the supernatant and 4 ml of 0.5 % thiobarbituric acid (TBA) in 20 per cent of TCA was mixed. The mixture was heated at 95 ◦C for 30 minutes and cooled in ice bath. It was centrifuged at 10,000 rpm for 5 minutes and the absorbance of supernatant was recorded at 532 nm. The value for nonspecific absorption at 600 nm was subtracted from that of 532 nm. The MDA content was calculated using its absorbtion coefficient of 155 $nmol^{-1}cm^{-1}$.

$$\text{MDA content} = \frac{\text{OD X 6/ 0.155 X Volume extract}}{\text{2 X weight of sample (n mol } g^{-1}\text{fw)}}$$

Pooled data of two years was taken (2018 & 2019) for drawing conclusions after subjecting the same to statistical analysis using the statistical package SPSS (20.0) at 5% critical difference (CD) for testing the significant differences among the treatment means and Correlation of yield with all the traits were analyzed using computer software Genres.

3. RESULT AND DISCUSSION

3.1 Effect of sowing media and variety on physiological parameters of seedling

Total chlorophyll content, stomata number, relative water content and dry matter accumulation are some of the critical physiological parameters that affect the final crop yield. Table 1 revealed most of the physiological attributes in nursery were significantly influenced by different sowing media and the interaction of media and variety. Varieties showed significant difference with respect to stomata number (lower surface) of leaves only. Based on two consecutive years pooled data, seedlings raised on M_3 recorded the highest chlorophyll content (0.98 mg g^{-1}fw) followed by M_2 (0.93 mg g^{-1}fw). The lowest chlorophyll content (0.74 mg g^{-1}fw) was recorded in M_4.

Media M_2 consisting of cocopeat and vermicompost recorded maximum stomata number/mm^2 both in upper and lower surface surface **(**83.47 and 150.97), relative water content (90.06 %) and dry matter accumulation (11.41%). Media M_1 recorded the lowest stomata number (69.03) of upper surface of leaf and dry matter accumulation (9.81%) while conventional nursery *i.e* M_4 recorded he minimum (137.95) stomata number in lower surface and relative water content (81.75%) of leaf. Between the two varieties, V_1 recorded significantly higher stomata number of lower surface (145.06) than V_2.

The interaction effects were statistically significant with a maximum chlorophyll content (0.98mg g^{-1}fw) recorded by M_3V_1 which was at par with M_3V_2 and followed by M_2V_1 and M_2V_2. The lowest chlorophyll content was recorded in M_4V_1 and at par with M_4V_2. The treatment combination M_2V_2 recorded the maximum (87.11 and 154.75) stomata number of both upper and lower surface,M_2V_1 recorded the highest relative water content (92.06 %) and dry matter accumulation (12.19 %).The lowest stomata number in both surfaces was recorded in M_4V_2, lowest relative water content in M_4V_1 and minimum dry mater accumulation in M_1V_2.

Leaf is very important part of the plant which accomplishes photosynthesis and translocates nutrients to various sinks to support physiological activities. The increase in chlorophyll content in leaves of seedling with application of medium combination along with vermicompost and Azotobacter may be due to stimulated nutrient uptake specially nitrogen and synthesis of chlorophyll which have role in the assimilation of numerous amino acids that are subsequently incorporated in proteins and nucleic acid, which provides framework for chloroplast results into better chlorophyll content in leaves of treated plant. Leaf stomata are considered to play an important role in plant adaptation to different environmental condition. Also, the number of stomata varies according to the plant species. Cauliflower has amphistomatous leaves i.e. stomata are on the upper and lower epidermis. In this study maximum stomata number was recorded in M_2 but at par with M_3. Literatures are meager regarding effect of cocopeat and vermicompost or cocopeat, vermicompost and microbial consortium on stomata number of vegetable seedlings. But there are studies reporting that microbiological fertilizer Slavol increases the stomatal density in strawberry [5]. Similar results were reported by [6] in broccoli and [7] in cauliflower plants.

Relative water content was found high in the treatment M_2 which, however, was at par with M_3. It would be pertinent to mention that plant water potential is related to soil/media water potential. Again, the role of biofertilizers and organic manures in improving physical condition for enhancing moisture retention capacity leading to increased water uptake by plants are well documented. Thus, the increase in relative water content can reasonably be related to ameliorating effect mediated through biological and organic source of nitrogen. *Azospirillum* enhanced root proliferation and facilitates the absorption of available water. In general leaf relative water content serves as a good index of photosynthetic activity since photosynthesis is highly dependent on turgidity in leaves.

Vermicomposting converts the nutrients in the original waste to readily available forms for plant uptake such as nitrate, ammonium, exchangeable calcium and magnesium, and soluble phosphorus. Because of this increase in accumulation of biomass in plants occurs which ultimately enhances the dry matter content. This is in conformity with [8]. The synergistic effect of better physico–chemical properties of media and genetical character of the variety might have led to better physiological condition of the seedlings than raised in conventional nursery.

3.2 Physiological parameters of plants in the field as affected by seedlings grown in different media

Different physiological parameters (relative water content, chlorophyll content at 30 DAT and at harvesting, membrane stability index and lipid peroxidation) were significantly affected by sowing media (Table 2). Significant effect of variety was observed only for relative water content and membrane stability index. Significant interaction effect was recorded for all parameters. Seedlings raised in M_3 media in nursery showed the highest relative water content (93.62 %), maximum chlorophyll content (1.40 and 2.16 mg g^{-1}fw) at 30 DAT and at harvest, maximum membrane stability index (65.32%) and minimum lipid peroxidation (0.85n mol g^{-1}fw) in field which was statistically superior to all other media. The media M_4 showed minimum leaf relative water content (83.54%), minimum chlorophyll content (0.83 and 1.31mg g^{-1}fw) at 30 DAT and at harvest, minimum membrane stability index (38.70%) and maximum lipid peroxidation (1.47n mol g^{-1}fw).

The highest relative water content (89.48 %) was recorded in variety White Diamond (V_1) and maximum membrane stability index (55.10%) in the variety CFL 1522 (V_2). Among interactions, M_3V_1 maintained superiority to other treatment combination exhibiting maximum relative water content of 93.90%, maximum chlorophyll content ((1.46 and 2.25 mg g^{-1}fw) at 30 DAT and at harvest and the highest membrane stability index (66.23%). The lowest lipid peroxidation (0.76 $nmolg^{-1}fw$) was recorded in M_3V_2. The combination M_4V_2 exhibited lowest relative water content (82.58%) and chlorophyll content at 30 DAT and at harvest (0.82 and1.28mg $g^{-1}fw$) and while M_4V_1 recorded the lowest membrane stability index (38.63 %) and the highest lipid peroxidation (1.50 $nmolg^{-1}fw$) was observed in leaves of M_4V_2. Longer roots and higher volume of roots might be the probable cause of higher leaf relative water content as these parameters were better manifested in the nursery media itself.

The total leaf chlorophyll content can be used as a nitrogen status indicator because this is an essential element in photosynthetic protein synthesis [9]. Chlorophyll content reflects the intensity of plant photosynthetic capacity and the extent of leaf senescence [10]. The higher nitrogen assimilation in the seedlings grown in M_3 because of biofertilizer affects might have been carried over to field performance also.

Membrane stability index reflects the capacity of a plant to stand in adverse or stress situation. The seedlings grown in vermicompost develops strong cell wall structure which improves the stability of membrane as vermicompost is the source of nitrogen, phosphorous, potassium, calcium, magnesium and sulphur along with other micronutrients like iron and zinc. The microbes present in biofertilizer help in better assimilation and absorption of these nutrients in seedlings. Higher water retention capacity of cocopeat helps in water uptake by seedlings, thus development of strong cell wall and that might have also led to a higher membrane stability index in the plants from the M_3 media grown seedlings in field also. Maximum membrane stability expressed in V_2(CFL 1522) was definitely due to inherent varietal character of the variety.

Lipid peroxidation is a factor in the development of plant tissue senescence. Delay in senescence might be due to presence of ethylene inhibitors or cytokinin produced by biofertilizer which delay senescence of plant tissue. Lipid hydro peroxides are non radical intermediates derived from unsaturated fatty acids, phospholipids, glycolipids, cholesterol esters and cholesterol. The formation of peroxides occur during the enzymatic or non enzymatic reactions involving activated chemical species known as “reactive oxygen species” (ROS) which are responsible for deleterious effects in the body via various tissue damages [11]. Application of microbial consortium might have activated some enzymes and antioxidant compound in plant cell in M_3 for which lower lipid peroxidation was recorded.

3.3 Correlation of curd yield with different physiological parameters: From the table 3 it was observed that curd yield was positively and significantly correlated with Chlorophyll content (r = 0.911) of seedling. After transplanting in field also curd yield was significantly and positively corelated with chlorophyll content at 30 DAT and at harvest (r=0.908 & r= 0.891). This suggest a very strong positive relationship between curd yield and chlorophyll content because higher chlorophyll content in seedling and in plants led to increased photosynthates production and ultimately increased the yield. It was observed that there was significant and positive correlation of curd yield with relative leaf water content at harvest(r=0.784), and membrane stability index (r=0.907) suggesting a great impact of these two parameters with yield. Strong negative correlation of curd yield was observed with lipid peroxidation (- 0.951). There was no significant correlation of stomata no, relative leaf water content and dry matter content of seedling with curd yield.

4.CONCLUSION

After conducting the experiment it can be concluded that that media play a significant role in the physiological parameters of seedling as well as in the main field also.In nursery seedlings raised on M_3 exhibited the highest chlorophyll content but for other physiological parameter Media M_2 showed the superiority. But in field seedlings raised in M_3 media in nursery showed the highest relative water content, maximum chlorophyll contentat 30 DAT and at harvest, maximum membrane stability index and minimum lipid peroxidation which was statistically superior to all other media. Therefore media M_3 can be used for growing seedlings in nursery which will give better performance in field also. Varieties showed non significant difference to most of the parameters except stomata number (lower surface) of leaves in nursery while in case of field condition only the relative leaf water content and membrane stability index showed significant differences suggesting more number of varieties to be experimented. From this study it can be indicated that chlorophyll content at seedling stage, crop growth and at harvest stage, relative leaf water content and membrane stability index at harvest have a direct influence on curd yield of cauliflower*i.e.* increase in these parameters increases the curd yield and *vice -versa*.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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Table 1: Effect of sowing media and varieties on physiological parameters of cauliflower seedling

Media(M)	Chlorophyll content (mg g^{-1}fw)	Stomata no/mm^2 (Upper surface)	Stomata no/mm^2 (Lower surface)	Relative water content (%)	Dry matter accumulation (%)
M_1(3Cp:1Vm:1Pr)	0.83	69.03	138.93	83.76	9.81
M_2(1Cp: 1Vc)	0.93	83.47	150.97	90.06	11.41
M_3(1Cp:1Vc:MC)	0.98	80.41	147.07	87.52	9.99
M_4(Soil:Sand: FYM)	0.74	70.29	137.95	81.75	10.05
S.Ed.($\pm$)	0.01	1.57	1.77	2.28	0.57
CD(0.05)	0.02	3.19	3.59	4.63	1.15
Variety(V)					
V_1 (White Diamond)	0.87	76.46	145.06	87.07	10.54
V_2 (CFL 1522)	0.87	75.14	142.40	84.48	10.10
S.Ed.($\pm$)	0.01	1.11	1.25	1.61	0.40
CD(0.05)	NS	NS	2.54	NS	NS
Interaction (MXV)					
$T_1(M_1V_1)$	0.84	68.22	140.34	86.92	10.29
$T_2(M_1V_2)$	0.82	69.83	137.50	80.60	9.34
$T_3(M_2V_1)$	0.94	79.83	147.20	92.06	12.19
$T_4(M_2V_2)$	0.92	87.11	154.75	88.05	10.64
$T_5(M_3V_1)$	0.98	82.56	150.29	89.56	9.58
$T_6(M_3V_2)$	0.97	78.26	143.86	85.48	10.40
$T_7(M_4V_1)$	0.74	75.22	142.41	79.73	10.09
$T_8(M_4V_2)$	0.75	65.37	133.50	83.78	10.01
S.Ed.($\pm$)	0.01	2.22	2.50	3.23	0.80
CD(0.05)	0.03	4.51	5.07	6.55	1.62

Cp: Cocopeat Vm: Vermicullite ,Pr: perlite, Vc: Vermicompost MC: Microbial Consortia

Table 2 : Effect of sowing media and variety on physiological parameters of cauliflower plants in field

Media(M)	Relative water content (%)	Chlorophyll content (mg g^{-1}fw)		Membrane stability index (%)	Lipid peroxidation (n mol g^{-1} fresh weight of leaf)
		At 30 DAT	At Harvest	At Harvest	At Harvest
M_1 (3Cp:1Vm:1Pr)	87.31	1.10	1.41	49.82	1.23
M_2 (1Cp: 1Vc)	91.80	1.31	1.71	59.40	1.12
M_3 (1Cp:1Vc:MC)	93.62	1.40	2.16	65.32	0.85
M_4 (Soil:Sand: FYM)	83.54	0.83	1.31	38.70	1.47
S.Ed.($\pm$)	0.19	0.02	0.04	1.68	0.04
CD(0.05)	0.39	0.05	0.08	3.40	0.08
Variety(V)					
V_1 (White Diamond)	89.48	1.17	1.67	51.53	1.19
V_2 (CFL 1522)	88.65	1.15	1.63	55.10	1.14
S.Ed.($\pm$)	0.14	0.02	0.03	1.18	0.03
CD(0.05)	0.27	NS	NS	2.40	NS
Interaction (MXV)					
$T_1(M_1V_1)$	89.01	1.07	1.38	45.20	1.28
$T_2(M_1V_2)$	85.62	1.13	1.45	54.44	1.18
$T_3(M_2V_1)$	90.51	1.31	1.69	56.04	1.11
$T_4(M_2V_2)$	93.08	1.31	1.74	62.76	1.12
$T_5(M_3V_1)$	93.90	1.46	2.25	66.23	0.93
$T_6(M_3V_2)$	93.33	1.33	2.07	64.42	0.76
$T_7(M_4V_1)$	84.51	0.84	1.35	38.63	1.44
$T_8(M_4V_2)$	82.58	0.82	1.28	38.77	1.50
S.Ed.($\pm$)	0.27	0.03	0.06	2.37	0.06
CD(0.05)	0.55	0.07	0.12	4.81	0.12

Cp: Cocopeat, Vm: Vermicullite, Pr: perlite, Vc: Vermicompost MC: Microbial Consortia

Table 3: Correlation matrix for physiological behavior and curd yield of early cauliflower

Legend: CC=chlorophyll content, SN= stomata number, RLWC= relative leaf water content, DMC=dry matter content, MT= mesophyll thickness, MSI=membrane stability index, LP=lipid peroxidation
** :significant 0.01% level ,* : significant at 0.05% level

Variables	Curd yield	CC of seedling at transplanting	SN (upper surface) of seedling at transplanting	SN (lower surface) of seedling at transplanting	RLWC of seedling at transplanting	DMC of seedling at transplanting	RLWC at harvest	CC at 30 DAT	CC at Harvest	MSI at harvest	LP at harvest
Curd yield	1	0.911**	0.558 ^{NS}	0.483 ^{NS}	0.533 ^{NS}	0.157 ^{NS}	0.784*	0.908**	0.891**	0.907**	-0.951**
CC of seedling at transplanting		1	0.730*	0.722*	0.765*	0.328^{NS}	0.955**	0.976**	0.909**	0.935**	-0.923**
SN (upper surface) of seedling at transplanting			1	0.971**	0.543^{NS}	0.345^{NS}	0.803*	0.749*	0.721*	0.755*	-0.609^{NS}
SN (Lower surface) of seedling at transplanting				1	0.623^{NS}	0.355 ^{NS}	0.829*	0.750*	0.667^{NS}	0.717*	-0.550^{NS}
RLWC of seedling at transplanting					1	0.644^{NS}	0.714*	0.713*	0.553^{NS}	0.557^{NS}	-0.474^{NS}
DMC of seedling at transplanting						1	0.270^{NS}	0.231^{NS}	0.038^{NS}	0.095^{NS}	-0.108^{NS}
RLWC at harvest							1	0.933**	0.878**	0.899**	-0.873**
CC at 30 DAT								1	0.889**	0.966**	-0.900**
CC at Harvest									1	0.899**	-0.909**
MSI at harvest										1	-0.926**
LP at harvest											1

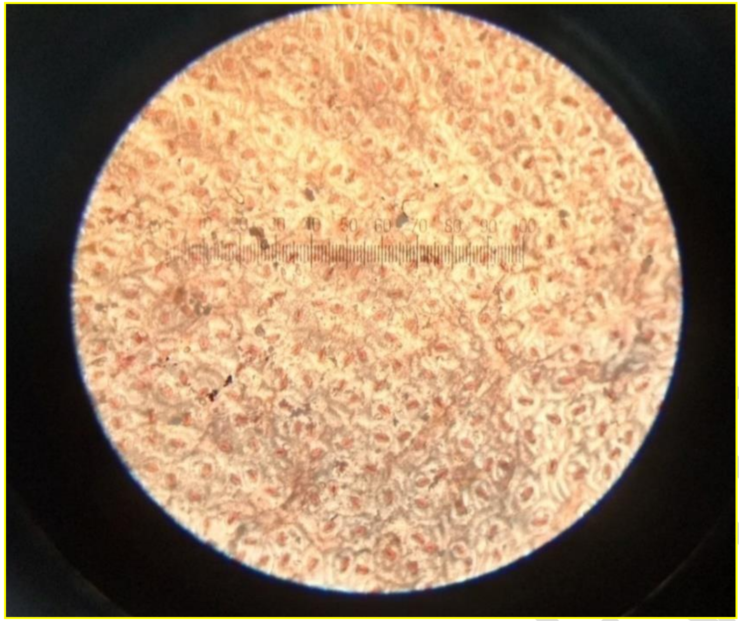

Fig 1:M_2V_2 exhibiting maximum stomata number

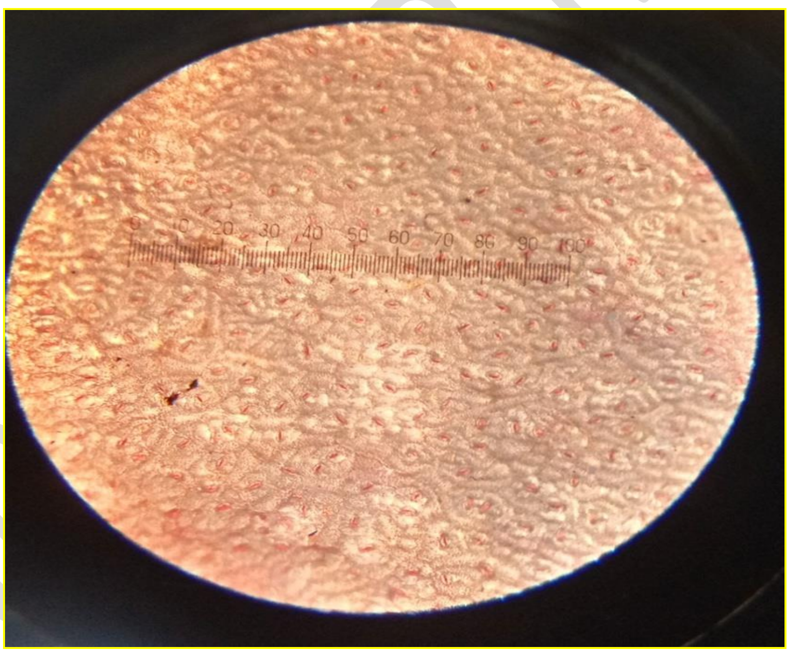

Fig 2: M_4V_2 exhibiting minimum stomata number