Pollen output and influence of weather parameters on secretion of nectar in the flowers of wild and cultivated varieties of Jamun (*Syzygium cuminii* L.)

ABSTRACT

Studies on flowering behaviour, pollen production, nectar secretion of wild and cultivated varieties of Jamun with special focus to influence of weather parameters on secretion of nectar revelled that the initiation of inflorescence from inter nodal region was observed during January, 2018. A total of 40 ± 0.82 to 46 ± 0.82 days were required from initiation of inflorescence to first flower opening. 50 and 100 per cent flowering was observed during 3rd and4th weeks of March with a total of four weeks flowering duration. The pollen output per flower was highest in wild *S. cumini* and lowest in N-20. The mean quantity of nectar produced was highest in K-45 and TSS content was highest in GKVK-2. The quantity of nectar produced had a highly significant negative correlation, a highly significant positive correlation at one per cent level and a non-significant negative correlation with hourly temperature, relative humidity and wind speed, respectively. The per cent total soluble solids present in the nectar at hourly intervals showed a highly significant positive correlation and a highly significant negative correlation with hourly temperature and relative humidity at one per cent level, respectively.

Keywords: Flowering behaviour, pollen, nectar, weather parameters

1. INTRODUCTION

Jamun is a common, large, evergreen and important fruits of Indian sub-continent. It is originated from Indonesia and India. In India jamun trees are found scattered throughout the tropical and sub-tropical regions. It is valuable for reforestation programmes in arid and semi-arid regions due to its ability to adapt to high alkaline soils (Anju Bajpai *et al*., 2012).

The flower bud initiation of S*yzygium alternifolium* occurs in late March while flowering occurs during mid - April to mid - May. The number of flowers opening each day is initially small and increases rapidly with a peak mass flowering for a fortnight and then declining rapidly (Solomon Raju *et al*., 2014). Pollen and nectar are important proteins and carbohydrates resource for pollinators although these high energy supplies are limited in time

and space (Brown *et al.*, 1981: Ramalho *et al.*, 1991: Galen and Geib 2007: Tiple *et al.*, 2009).

The flowers are good source of nectar and pollen for attracting insect visitors (Bajpai, *et al.*, 2012). The flowers of *S. alternifolium* produce a total of 12.7 ± 4.32 µl of nectar from a coloured part of the cup continuously for a period of four days from the time of anthesis. The nectar sugar concentration was 16.44 ± 3.1 per cent, including sucrose (2.55 µg), fructose (2.37µg) and glucose (0.13 µg) with a total of 2.55 µg of protein content in nectar. Each anther of *S. alternifolium* produce 4136 ± 192 pollen grains with a total of 5, 25,272 ± 12408 pollen grains per flower (Solomon Raju *et al*., 2014).

Dattilo *et al.* (2012) reported that the volume of nectar produced by flowers and the concentration of sugars in nectar did not differ between the strata of *S. jambolanum.* The quantity of nectar produced in the upper stratum (3.86 ± 2.06mL) and in the lower stratum (3.9 ± 1.75mL) was almost the same, with a mean sugar concentration of 25.29 ± 10.3 per cent in the upper stratum and 25.47 ± 13.82 per cent in the lower stratum.

The mean nectar volume per flower of *S. ocidentale* at anthesis was 71.01µl and the concentration of the sugar equivalence in the nectar was 13.59 per cent. The stamens in the flower spread out and remained fresh, erect and turgid until about 10:00 h on the day, following anthesis, later the anthers started withering and the stamens became flaccid and sag. The mean number of pollen grains per anther was estimated to be 13,569 (Giby Kuriakose *et al*., 2018).

The attraction of a specific pollinator species is majorly dependent on the floral trait and the available floral resources as a reward to the pollinating species in the form of pollen and/or nectar may also be preferred with either high quality and quantity or both. A continuous and large scale pollen production is therefore necessary for the successful pollination and fruit set at a high reproductive cost. The aim of this study was to evaluate the flowering behaviour, pollen production and nectar secretion of wild and cultivated varieties of Jamun with special focus to influence of weather parameters on secretion of nectar.

2. MATERIALS AND METHODS

2.1 Study area

The study on "Pollen output and influence of weather parameters on secretion of nectar in the flowers of wild and cultivated varieties of Jamun (*Syzygium cuminii* L.)" was carried out at Regional Horticultural Research and Extension Centre, College of Horticulture (RHREC); UHS sub campus, GKVK, Bengaluru-560 065 during the flowering period of 2018-19.

2.2 Wild and Cultivated Varieties of *S. cumini*

The observations on flowering behaviour, pollen production, nectar secretion and influence of weather parameters on secretion of nectar were made on four cultivated varieties of *S. cumini* viz., GKVK-1, GKVK-2, K-45, N-20 in jamun orchard which were six years old planted at the spacing of 5m x 5m and also on naturally grown wild *S. cumini* trees of more than six-year-old at experimental site, RHREC, College of Horticulture; UHS sub-campus, GKVK, Bengaluru.

2.3 Flowering behaviour

Initiation of inflorescence

The four randomly selected branches which were at chest height from each of the wild and cultivated varieties of *S. cumini* in four different directions were observed daily starting from January 2018 until for the development of sprout at the inter nodal region and day of sprout initiated was recorded and treated as day / period for the initiation of inflorescence.

Days required for first flower opening

Four randomly selected inflorescence at the sprout stage from each of the wild and cultivated varieties of *S. cumini* in four different directions were tagged and were observed daily during January 2018 starting from initiation of inflorescence at the sprout stage until opening of first flower. The day on which the first flower opens form fully grown tagged inflorescence, that day was recorded and treated as a day of first flower opening/ period of commencement of flowering and total days taken from initiation of inflorescence to first flower opening was calculated.

Time of 50 or 100 per cent flowering

The visual observation was made on number of floral buds opened per inflorescence in all the branches of selected four trees of wild and cultivated varieties of *S. cumini* starting from their period of first flower opening until the completion of flowering. Based on the

proportion of the floral buds opened per inflorescence during the observation period, the flowering was categorised as a period of 50 and 100 per cent flowering.

Estimation of pollen yield per anther

On the previous day of pollen yield estimation**,** the inflorescence having matured floral buds of wild and cultivated varieties of *S. cumini* were covered with perforated nylon bags in order to prevent the floral visitors from assessing the pollen grains from the flowers. After complete dehiscence, perforated nylon bags were removed and flowers were collected in butter-paper bags, brought to the laboratory. Single anther each from the stamen of the flowers of wild and cultivated varieties of *S. cumini* were removed in the morning hours before dehiscence and transferred on to glacial acetic acid in 1 ml eppendorf vials. Pollen grains were extracted and counted by using a haemocytometer. Number of pollen grains per anther (A) was calculated using the standard formula (Godini, 1978). The procedure was repeated to count the pollen grains from upto ten anthers and the mean was calculated. By using same data, pollen output per flower and pollen to ovule ratio was calculated. The pollen yield of single anther was expressed as average number of pollen grains per anther

$$A = \frac{n \times B}{N}$$

Where, n = number of pollen grains inside each small chamber, B = fraction of suspension retained by each small chamber in relation to the original amount of suspension of each

vial. N= no. of anthers per vial.

Pollen output per flower

The pollen output of the flower is the total number of pollen grains produced in the flowers of wild and cultivated varieties of *S. cumini* and it was calculated by using the standard formula,

Pollen output = Average number of pollen grains per anther of flower× Average number of stamens per flower. It is expressed as average number of pollen grains per flower

Pollen: Ovule Ratio

Pollen: ovule ratio is the ratio between the numbers of pollen grains to the number of ovules present in a given flower of wild and cultivated varieties of *S. cumini*.

Quantification of nectar yield per flower

On the previous day of nectar estimation, the inflorescences having fully matured floral buds from wild and cultivated varieties of *S. cumini* were selected and were covered with perforated nylon bags in order to prevent the floral visitors from assess to the nectar from the flowers. The nectar produced in the flowers was estimated during 2nd week of March 2018 from 10th to 14th March, 2018 for the period of five days at GKVK. On the day of nectar estimation, perforated nylon bags were removed and nectar produced in fully opened five flowers was estimated from 0600 to 1900 hr at hourly intervals by using calibrated capillary tube, again, the same inflorescence was covered with perforated nylon bags (Belavadi and Ganeshaiah, 2013). Five fully opened fresh flowers were utilized for nectar estimation at hourly intervals and the mean was calculated. Similar procedure was repeated upto five days for the estimation of the nectar from the flowers (n=25). The quantified nectar was expressed in µl/flower. The weather parameters prevailed from 0600-1900 hrs at hourly intervals during observation period was utilized for correlation studies.

Total Soluble Solids of nectar (TSS)

Total soluble solids present in the extracted nectar from the flowers of wild and cultivated varieties of *S. cumini* at GKVK during 10th to 14th March, 2018 at hourly intervals from 0600 to 1900 hr was determined by using "Hand Refractometer" of 0-32, 28-62, 58-92 range and expressed in per cent. The weather parameters prevailed from 0600-1900 hrs at hourly intervals during observation period was utilized for correlation studies.

3. RESULTS AND DISCUSSIONS

Flowering behaviour

The observation on flowering behaviour of wild and cultivated varieties of *S. cumini* includes the initiation of sprout at internodal region of branches for growth and development of inflorescence. The sprout at the emerging stage from four branches were selected randomly in four different directions from wild *S. cumini* and cultivated varieties; GKVK-1, GKVK-2, K-45 and N-20 were visually observed daily during January 2018. The results on flowering behaviour revealed that initiation of the sprout in the tagged branches of wild *S.*

cumini at GKVK was observed during 3rd week of January. The first flower of fully grown inflorescence from the sprout of GKVK-1opened during 3rdweek of February and the sprout from GKVK-2, K-45 and N-20 opened during 1st week of March, with a total duration from initiation of inflorescence to first flower opening ranging from 40±0.82 (K-45) to 44 ± 1.41 (GKVK-2) days. However, irrespective of wild and cultivated varieties of *S. cumini*, the number of days taken from initiation of inflorescence upto first flower opening ranged from 40 ± 0.82 (K-45) to 46 ± 0.82 (wild *S. cumini*) days (Table 1 & Plate 1a to e). The variation in the initiation of inflorescence and the number of days taken from initiation of inflorescence to first flower opening is attributed to the variation in species /varietal traits. These findings are supported by earlier reports of Devi *et al*., (2002) in the selected jamun (*Syzygium cumini* Skeels) genotypes wherein, the floral initiation was observed from last week of February upto mid – April. Flowering of jamun was initiated in first week of March and continued upto the end of April, with total flowering duration of around four weeks (Bajpai and Chaturvedi, 1985; Tarai *et al*., 2006).

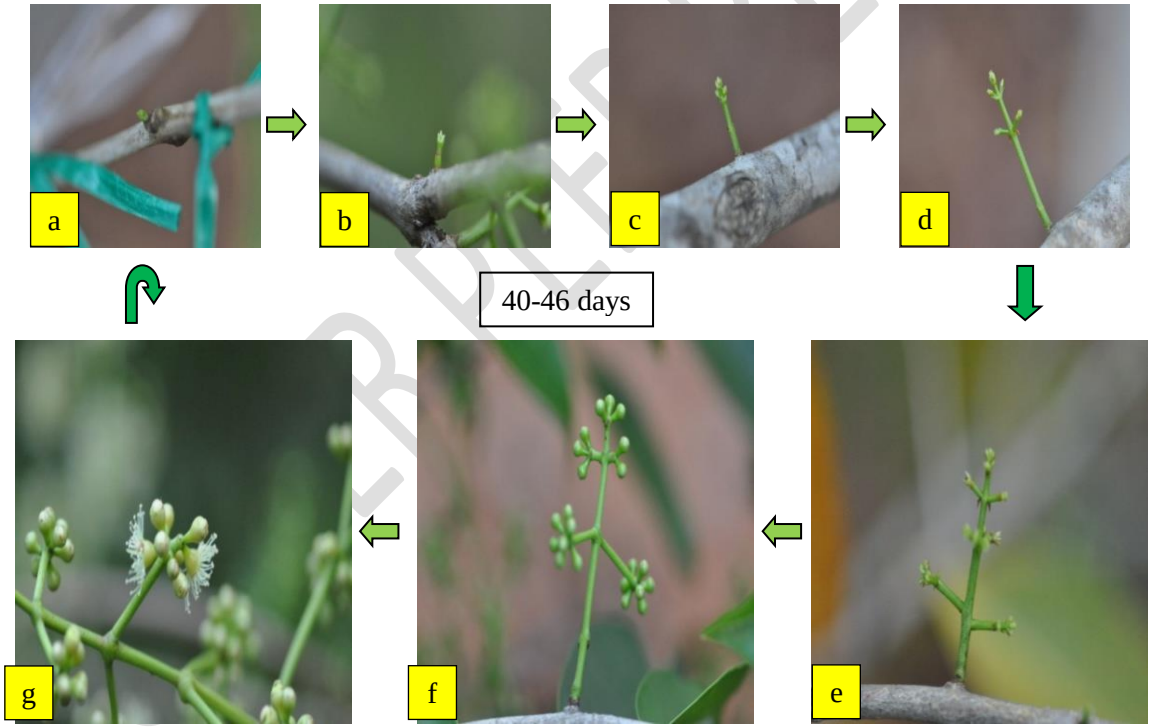


Plate 1: Days required from initiation of inflorescence to first flower opening in wild and cultivated varieties of *S. cumini* : a) Bud tagged at initiation stage b) to d): Bud elongation e) & f): Flower bud initiation g) Opening of flower

Table 1: Flowering behavior of wild and cultivated varieties of *S. cumini* at GKVK, Bengaluru

Wild/ cultivated varieties	Initiation of inflorescence	First flower opening	No. of days taken for first flower opening	Period of initiation of flowering	Time of 50% flowering	Time of 100% flowering
Wild *S. cumini*	17/01/18	03/03/18	46±0.82	March 1st week	3rd week of March	4th week of March
GKVK-1	11/01/18	20/02/18	41±1.83	Feb 3rd week	2rd week of March	3rd week of March
GKVK-2	21/01/18	05/03/18	44±1.41	March 1st week	3rd week of March	4th week of March
K-45	22/01/18	02/03/18	40±0.82	March 1st week	3rd week of March	4th week of March
N-20	24/01/18	06/03/18	42±0.82	March 1st week	3rd week of March	4th week of March

Estimation of pollen yield per anther and per flower

The data on number of ovules per flower and number of stamens per flower was utilized for the estimation of number of pollen grains in the flowers of wild and cultivated varieties of *S. cumini*. The laboratory estimation of number of pollen grains present in single completely dehisced anther (Godini, 1978) revealed that the anther of cultivated variety, K-45 (4151 ± 2.58) had maximum number of pollen grains (Table 2) followed by wild *S. cumini* (4064.25 ± 2.99), N-20 (3956 ± 2.31), GKVK-1 (3915.25 ± 3.59) and the lowest number of pollen grains were recorded in the anther of the flower of GKVK-2 (3898 ± 2.94).The calculated pollen output per flower in terms of average number of pollen grains were found to be maximum in wild *S. cumini* followed by (277710.2 ± 3 459.64), K-45 (264252.7 ± 8496.01), GKVK-1 (253026.4 ± 7325.3), GKVK-2 (248146.7 ± 8496.01) and lowest was recorded in N-20 (246577.5 ± 9686.35). The number of pollen grains to the number of ovules present in a given flower was found to be maximum in wild *S. cumini* (34713.81) followed by K-45 (33031.58), GKVK-1 (31628.30), GKVK-2 (31018.34) and the lowest was recorded in N-20 (30822.19). The variation in the average number of pollen grains per flower may attribute with the variation in the average number of pollen grains per anther and number of stamens per flower among the wild and cultivated varieties of *S. cumin*i. The findings in the present study are supported by Solomon Raju *et al*. (2014) who recorded around 4136 ± 192 pollen grains per anther with a total of 5, 25,272 ± 12408 pollen grains per flower of *S. alternifolium*. The pollen to ovule to ratio varied from 13,833 to 25,013.

Table 2: Pollen output and pollen: ovule ratio of wild and cultivated varieties of *S. cumini* at GKVK, Bengaluru

Wild/ cultivated varieties	Mean number of ovules/flower	Mean number of stamens/flower	Mean number of pollen grains/anther	Mean.number of pollen grains/ flower	Pollen : Ovule ratio
Wild *S. cumini*	8	68.33±1.56	4064.25±2.99	277710.2±3459.64	34713.81
GKVK-1	8	64.63±1.63	3915.25±3.59	253026.4±7325.3	31628.30
GKVK-2	8	63.66±1.97	3898±2.94	248146.7±8496.01	31018.34
K-45	8	63.66±2.48	4151±2.58	264252.7±8496.01	33031.58
N-20	8	62.33±2.64	3956±2.31	246577.5±9686.35	30822.19

Quantification of nectar yield per flower

The quantity of nectar produced in fully opened five fresh flowers of wild and cultivated varieties of *S. cumini* was estimated by using calibrated capillary tube from 0600 to 1900 hr at hourly interval for the period of five days during 2nd week of March, 2018. The quantity of estimated nectar revealed a significant variation among the flowers of wild and cultivated varieties of *S. cumini* (Table 3). The secretion of nectar in the flowers by nectar glands was found in the yellow coloured part of the ovary (Plate 2).

In the beginning of the day (0600 -0700hr), the initial quantity of nectar produced was found to be more in the flowers of wild *S. cumini* (7.87 µl/flower), followed by cultivated variety, GKVK-1 (7.80 µl/flower), N-20 (7.30 µl/flower), K-45 (7.27 µl/flower) and the nectar produced was lowest in GKVK-2 (6.94 µl/flower). The quantity of nectar production in the flowers was found to be increased at 1000–1100hr of the day, with a maximum quantity of nectar recorded in GKVK-1 (20.84 µl/flower), followed by K-45 (18.50 µl/flower), GKVK-2 (17.22 µl/flower), N-20 (16.60 µl/flower) and in the flowers of wild *S. cumini* (16.49 µl/flower). The quantity of nectar production was found to decline as the day progressed and reached a minimum in GKVK-1(1.23 µl/flower) followed by N-20 (1.4 µl/flower), wild *S. cumini* (1.51 µl/flower), GKVK-2 (1.60 µl/flower) and in K-45 (1.61 µl/flower) at 1800-1900 hr of the day, with the exception of a slight increase in the nectar production at 1500-1600hr in N-20 (2.36/µl/flower) and at 1600-1700hr in GKVK-2 (2.28/µl/flower).Overall, the mean quantity of nectar produced was highest in the flowers of K-45 (6.56 µl/flower), followed by N-20 (6.31 µl/flower), GKVK-2 (6.29 µl/flower), wild *S. cumini* (6.24 µl/flower) and in the flowers of GKVK-1(6.02 µl/flower), respectively. The increase or decrease in the quantity of nectar secretion from the flowers of wild and cultivated varieties of *S. cumini* at hourly intervals may be attributed to the variations in the prevailing weather parameters of the experimental site. The findings in the present investigations are more or less in agreement with that of Solomon Raju *et al*. (2014) who stated that, a total of 12.7 ± 4.32 µl of nectar was produced in the flowers of *S. alternifolium* from a coloured part of the cup continuously for a period of four days from the time of anthesis. Giby Kuriakose *et al*. (2018) also recorded a mean nectar volume of 71.01µl per flower of *S. ocidentale* at anthesis.

The determined total soluble solids (TSS) of the nectar extracted from the five fresh flowers of wild and cultivated varieties of *S. cumini* at hourly intervals using Hand

Refractometer varied significantly (Table 3). In the beginning of the day (0600-0700hr), the initial TSS content of nectar was found to be more in the flowers of wild *S. cumini* (21.40%), followed by cultivated variety, GKVK-1(19.5%), N-20 (18.4%),GKVK-2 (17.90%) and that of K-45 (16.5%). TSS content of nectar in all the flowers of both wild and cultivated varieties of *S. cumini* was found to increase from 0600-0700hr and reached maximum at 1400–1500hr. The maximum TSS content of nectar was recorded in the flowers of GKVK-2 (74.70%), followed by K-45 (72.5%), GKVK-1 (71.32%) and that of wild *S. cumini* (68.2%). TSS content of nectar was in declining trend with the advancement of the day and reached to an extent of 65.12 per cent (GKVK-1), followed by 64.48 per cent (N-20), 63.72 per cent (K-45), 59.06 per cent (wild *S. cumini*) and 58.80 per cent (GKVK-2) at 1800-1900hr of the day. Over all, the mean TSS content of nectar was highest in GKVK-2 (43.78%) followed by wild *S. cumini* (43.05%), K-45 (42.98%), GKVK-1 (41.87%) and that of N-20 (41.48%). The increase or decrease in the per cent total soluble solids of the nectar from the flowers of wild and cultivated varieties of *S. cumini* at hourly interval may be attributed to the variations in the prevailing weather parameters of experimental site.

Prevailing meteorological factors of experimental site at GKVK during quantification of nectar from flowers of wild and cultivated varieties of *S. cumini*

The nectar produced in the flowers of wild and cultivated varieties of *S. cumini* at an hourly interval was estimated during 2^{nd} week of March, 2018 from 10^{th} March, 2018 to 14^{th} March, 2018 for the period of five days at GKVK. The prevailing hourly intervals meteorological data of experimental site during nectar yield quantification was collected from KSNMDC, Bangalore (Table 4).The hourly mean temperature of experimental site of GKVK ranged from 19.24^0 C (0600 -0700hr) to 32.14^0 C (1400-1500hr), hourly mean relative humidity was ranged from 31.70 (1400-1500hr) to 86.38 (0600-0700hr) per cent and hourly mean wind speed ranged from 0.30 (0600 -0700hr) to 1.88 (1200-1300hr) nautical miles per hour, respectively.

Correlation between nectar secretion and its TSS content in the flowers of wild and cultivated varieties of *S. cumini*

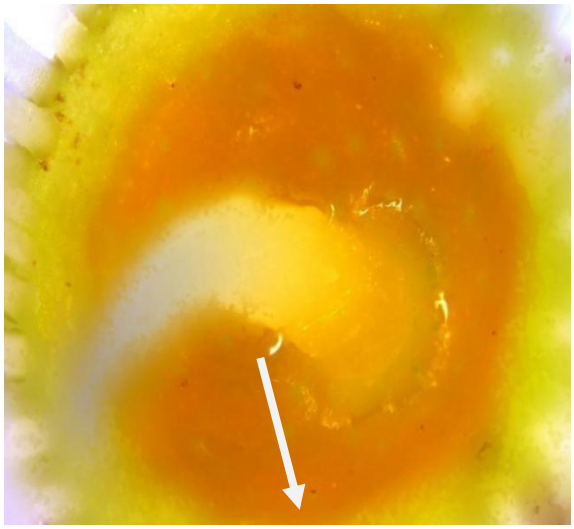
The quantity of nectar produced in the flowers of wild *S. cumini* and cultivated varieties, GKVK-1, GKVK-2, K-45 and N-20 at hourly intervals had a highly significant negative correlation with hourly temperature ($r=-0.57^{**}$, -0.48^{**}, -0.44^{**}, -0.47^{**}, -0.42^{**} and -0.48^{**}) at one per cent level, a highly significant positive correlation with hourly relative

humidity (r= 0.54**, 0.43**, 0.40**, 0.42**, 0.37** and 0.44**) at one per cent level (Table 5) and non-significant negative correlation with hourly wind speed (r=-0.23, -0.18, -0.15, -0.17,-0.14 and -0.18), respectively. Similarly, the per cent total soluble solids present in the nectar of the flowers of wild *S. cumini* and cultivated varieties, GKVK-1, GKVK-2, K-45 and N-20 at hourly intervals had a highly significant positive correlation with hourly temperature (r= 0.62**, 0.51**, 0.57**, 0.60** and 0.52**) at one per cent level and a highly significant negative correlation with hourly relative humidity (r= -0.55**, -0.48**, -0.51**, -0.55** and -0.50**), respectively at one per cent level. However, a non- significant positive correlation existed between total soluble solids present in the nectar of the flowers of wild *S. cumini* (r=0.32), K-45 (r=0.31) and N-20 (r=0.23) at hourly intervals with hourly wind speed and a significant positive correlation existed between total soluble solids present in the nectar of the flowers of GKVK-1 (r= 0.21*) and GKVK-2 (r= 0.27*) at hourly intervals with wind speed at five per cent level (Table 5).

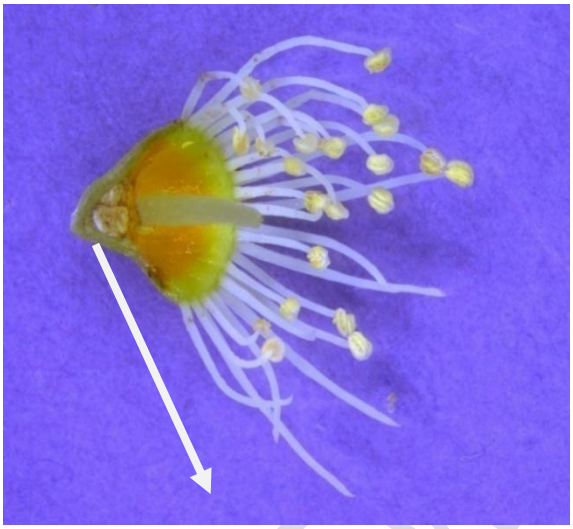
Table 3: Nectar secretion and its TSS content in the flowers of wild and cultivated varieties of *S. cumini* at GKVK, Bengaluru

Time (hr)	Wild and Cultivated varieties of *S. cumini*									
	Wild *S. cumini*		GKVK-1		GKVK-2		K-45		N-20	
	Nectar (µl/ flower)	TSS (%)	Nectar (µl/ flower)	TSS (%)	Nectar (µl/ flower)	TSS (%)	Nectar (µl/ flower)	TSS (%)	Nectar (µl/ flower)	TSS (%)
0600-0700	7.87^{a}	21.4^{i}	7.80^{e}	19.5^{j}	6.94^{e}	17.90^{l}	7.27^{d}	16.50^{f}	7.30^{e}	18.40^{j}
0700-0800	8.42^{e}	22.6^{h}	8.89^{d}	19.75^{j}	10.37^{d}	24.20^{k}	10.00^{c}	22.53^{e}	10.42^{d}	18.60^{j}
0800-0900	11.17^{c}	24.3^{g}	9.70^{c}	23.7^{i}	10.52^{c}	24.80^{k}	10.23^{c}	24.68^{e}	10.62^{c}	22.82^{i}
0900.1000	13.38^{b}	24.5^{g}	11.45^{b}	24.8^{h}	11.89^{b}	25.90^{j}	12.05^{b}	24.94^{e}	11.32^{b}	26.56^{h}
1000-1100	16.49^{a}	25.3^{gf}	20.84^{a}	27.6^{g}	17.22^{a}	27.10^{i}	18.50^{a}	25.56^{ed}	16.6^{a}	27.40^{hg}
1100-1200	8.97^{d}	25.8^{f}	7.13^{f}	29.1^{f}	6.44^{f}	28.50^{h}	7.95^{d}	26.70^{ed}	6.52^{g}	28.13^{g}
1200-1300	4.69^{g}	30.2^{e}	3.71^{g}	31.0^{e}	6.91^{e}	30.10^{g}	5.45^{e}	30.18^{d}	6.95^{f}	31.50^{f}
1300-1400	1.58^{i}	64.4^{b}	1.09^{k}	34.0^{d}	2.31^{g}	56.40^{f}	3.45^{f}	54.08^{c}	2.38^{h}	33.70^{e}
1400-1500	1.56^{ji}	68.2^{a}	1.04^{k}	71.32^{a}	2.02^{h}	74.70^{a}	2.75^{f}	72.50^{a}	2.32^{h}	69.60^{a}
1500-1600	1.94^{h}	67.3^{a}	1.83h	67.6^{b}	1.35^{k}	69.40^{b}	2.04^{h}	66.68^{b}	2.36^{h}	66.82^{b}
1600-1700	1.90^{h}	63.4^{cb}	$1.82h^{i}$	65.5^{c}	2.28^{g}	66.60^{c}	2.02^{h}	66.52^{b}	1.98^{i}	65.76^{c}
1700-1800	1.61^{i}	62.7^{c}	1.74^{i}	65.3^{c}	1.87^{i}	64.80^{d}	1.93^{h}	64.16^{b}	1.88^{i}	65.50^{c}
1800-1900	1.51^{j}	59.6^{d}	1.23^{j}	65.12^{c}	1.60^{j}	58.80^{e}	1.61^{h}	63.72^{b}	1.4^{j}	64.48^{d}
Mean	6.24	43.05	6.02	41.87	6.29	43.78	6.56	42.98	6.31	41.48
SE(m)	0.03	0.52	0.05	0.46	0.05	0.49	0.52	0.48	0.07	0.43
CD@5%	0.06	1.04	0.08	0.93	0.10	0.10	0.10	0.98	0.14	0.86
CV(%)	0.75	1.91	1.08	1.75	1.31	1.79	1.36	1.75	1.77	1.64

(Nectar, TSS -mean of 5flowers/day/hr X 5 days from 10-03 to 14-03-2018)



Yellow coloured part with nectar



Location of the nectar glands

Plate 2: View of nectar glands and nectar production in the flowers of wild and cultivated varieties of *S. cumini*

Table 4: Meteorological data of experimental site at GKVK, Bengaluru during nectar and TSS estimation from the flowers of wild and cultivated varieties of *S. cumini*

Time (hr)	Weather parameters		
	Temp (°C)	RH (%)	Wind speed (nautical miles/hr)
0600-0700	19.24	86.38	0.30
0700-0800	21.10	75.64	0.56
0800-0900	23.10	64.97	1.00
0900-1000	25.98	55.96	1.30
1000-1100	27.96	45.48	1.72
1100-1200	29.82	38.36	1.72
1200-1300	31.02	34.46	1.88
1300-1400	32.08	33.42	1.84
1400-1500	32.14	31.70	1.54
1500-1600	31.58	32.52	1.76
1600-1700	30.12	34.42	1.6
1700-1800	28.76	36.80	1.28
1800-1900	27.28	43.40	1.16

Weather parameters (Temp=temperature, RH=relative humidity and wind speed) are the mean from 10-03-18 to 14-03-18

Table 5: Correlation between the nectar secretion and its TSS content of nectar in the flowers of wild and cultivated varieties of *S. cumini* with prevailing weather parameters at GKVK, Bengaluru

Weather parameter	Wild and Cultivated varieties of *S. cumini*									
	Wild *S. cumini*		GKVK-1		GKVK-2		K-45		N-20	
	Nectar (µl/ flower)	TSS (%)	Nectar (µl/ flower)	TSS (%)	Nectar (µl/ flower)	TSS (%)	Nectar (µl/ flower)	TSS (%)	Nectar (µl/ flower)	TSS (%)
Temperature (°C)	-0.48**	0.62**	-0.44**	0.51**	-0.47**	0.57**	-0.42**	0.60**	-0.48**	0.52**
Relative humidity (%)	0.43**	-0.55**	0.40**	-0.48**	0.42**	-0.51**	0.37**	-0.55**	0.44**	-0.50**
Wind speed (nautical miles/hr)	-0.18 (NS)	0.32 (NS)	-0.15 (NS)	0.21*	-0.17 (NS)	0.27*	-0.14 (NS)	0.31 (NS)	-0.18 (NS)	0.23 (NS)

Note: ** Significant at 1 %, * Significant at 5% and NS- Non significant

4. CONCLUSION

From the present study it can be concluded that the initiation of inflorescence from inter nodal region was observed during January. Variation was observed in the number of days required from initiation of inflorescence to the first flower opening. The significant variation was observed in pollen output and quantity of nectar produced in the flowers. The quantity of floral rewards produced was a prime fact in attraction of pollinators. The weather parameters either they had significant positive or negative or non-significant positive or negative correlation with production of the floral nectar.

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 writing or editing of manuscripts.

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