Biological Forum – An International Journal **14(3): 1488-1491(2022)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Performance of Sweet Flag (*Acorus calamus* L.) accessions in Andhra Pradesh

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(Received 19 July 2022, Accepted 26 August, 2022)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: The present investigation was carried out to evaluate mean performances of sweet flag (*Acorus calamus* L.) accessions collected from different parts of India. The experiment was conducted at Horticultural Research Station, Venkataramannagudem during 2021-22. Total thirty-eight sweet flag accessions were evaluated with two replications in Randomized Block Design. Significant variation was observed among all the accessions with respect to growth, yield and yield attributing characters. Mean performance of accessions for growth, yield and yield attributing characters revealed that accession APAc-5 performed well among the thirty-eight accessions which recorded highest plant height (52.50cm), leaf length (46.01 cm), total number of leaves^{-1} (64.95), number of lets plant^{-1} (5.25), number of sprouts plant^{-1} (11.85), rhizome length (32.60 cm), rhizome girth (2.61 cm), fresh rhizome yield hectare^{-1} (62.78 q), dry rhizome yield hectare^{-1} (37.56 q). Hence, APAc-5 can be recommended for commercial cultivation in Andhra Pradesh and also can be utilised in further breeding programme.

Keywords: Sweet flag, introduction, Mean performance, Morphological characters, Accessions.

INTRODUCTION

Sweet flag (*Acorus calamus* L.), belongs to the family Acoraceae, is a grass-like, rhizome forming perennial that can grow upto 2 m high, resembling iris plant. It is a semi-aquatic or marshy perennial herb having 1.5m long and 2-4 cm wide narrow leaves with indefinitely branched rhizome creeping in mud.

Acorus calamus L. is an aromatic medicinal plant, rich in alkaloids, phenolics and flavonoids. Around 50% of modern American medicines come from natural sources, especially from various plants (Copping, 1996).It is a potential source of compounds possessing beneficial biological activities. It is an integral part of the traditional Indian and Chinese systems of medicines and has a long history of use (Wu *et al.*, 1994; Lee *et al.*, 2011). Due to the presence of essential oils (β-asarone, acorenone, isocalamendiol etc.), leaves possess pleasant and sweet odour. The secondary metabolites like alkaloids, terpenoids, glycosides, phenols, flavonoids and saponins possess medicinal properties (Bhatt *et al*., 2005) which have been scientifically tested for their insecticidal, anticancer, antimalarial (Chopra and Doiphode 2002), antibacterial (Bagrov *et al*., 2009), antifungal properties. Sweet flag rarely produces seeds and is mainly propagated by vegetative means.

MATERIALS AND METHODS

The experiment was conducted at Horticultural Research Station, Venkataramannagudem that is situated at 16°83'N latitude and 81°5' E longitude with an altitude of 34 m (112 feet) above the mean sea level. This zone experiences hot, humid summer, mild winter and with an average annual rainfall of 900 mm. The soil is red loamy with good drainage and moderate water holding capacity. The physical composition of the soil was 70 per cent sand, 20 per cent silt and 15 per cent clay. The soil pH was 5.96 and the EC was 0.3 dSm^{-1}. The available nitrogen, phosphorus and potassium contents were 512 kg, 17.52 kg and 217.5 kg ha^{-1} respectively. The available organic carbon content of the soil was 0.34 per cent.

Total thirty-eight sweet flag accessions were evaluated with two replications in Randomized Block Design during 2021-22. All the recommended intercultural operations were followed. The observations for fourteen traits *viz*., plant height (cm), leaf length (cm), leaf width (cm), number of leaves, number of nodes, rhizome internodal length (cm), number of sprouts, number of lets, rhizome length (cm), rhizome girth (cm), fresh rhizome yield ha^{-1} (q), dry rhizome yield ha^{-1}(q) were recorded randomly from five plants in each replication. Analysis of variance is done partitioning the

variation into treatments and replications according to procedure given by Analysis of variance given by Fisher and Yates (1963).

RESULTS AND DISCUSSION

The mean performance of all the accessions for fourteen different traits statistically significant were presented in Table 1.Plant height and leaf length in thirty-eight accessions ranged from 22.85 cm to52.50 cm and 13.18 cm to 46.01 cm with an average 38.54 cm and 28.39 cm respectively. Maximum plant height and leaf length were recorded in APAc-5 (52.50 cm&46.01 cm) followed by APAc-9 (51.90 cm), APAc-21 (37.03 cm) whereas minimum plant height and leaf length was recorded by TNAc-13 (22.85 cm & 13.18 cm) respectively. The leaf width in thirty-eight accessions ranged from 0.63 cm to 1.58 cm with an average 1.14 cm. Maximum leaf width was recorded by APAc-9 (1.58 cm) followed by APAc-5 (1.58 cm) whereas the minimum leaf width was recorded by Golaghat-6 (0.63 cm). Total number of leaves plant^{-1} ranged from 9.50 cm to 64.95 with an average 20.02. The highest number of leaves was recorded by APAc-5 (64.95) followed by APAc-9 (56.20) and TNAc-9 (9.50) registered the lowest number of leaves. These findings were in tune with results of several Kasturi *et al*. (2015); Avadhani *et al.* (2016); Priya *et al*. (2017), who reported genetic variation in *Acorus calamus* (L.) accessions of India and the results revealed that plant height recorded highest in ACSBL (61.7 cm) and lowest in ACAK (30.3 cm).

It is observed from the Table 1 that the internodal length ranged from 0.64 cm to 2.51 cm with an average 1.34 cm. Maximum internodal length was recorded by APAc-10 (2.51 cm) whereas the minimum internodal length was recorded by APAc-17 (0.64 cm). An average of 19.83 nodes plant^{-1}were produced in thirty accessions ranged from 9.40 to 34.40. The highest number of nodes plant^{-1} was recorded by APAc-14 (34.40) followed by ApAc-1(31.45) whereas Sunitur-4 (9.40) registered the lowest number of nodes plant^{-1}. Number of lets plant^{-1} ranged from 0 to 5.25 with an average 0.63. More number of lets plant^{-1} was recorded in APAc-5 (5.25). Number of sprouts plant^{-1} ranged from 0.50 to11.85 with an average 3.66. Morenumber of sprouts plant^{-1} was recorded in APAc-5 (11.85) followed by APAc-9 (11.75) whereas TNAc-8 (0.50) recorded fewer number of sprouts plant^{-1}. This is in corroboration with the finding of Rana *et al.* (2013); Kasture *et al.* (2015), who reported variability in *Acorus calamus* L. accessions of India and the results revealed that internodal length recorded highest in AC 19 (1.0-1.9 cm) and lowest in AC 10 (0.3-0.4 cm).

An average of 18.03 cm rhizome length, 1.43 cm rhizome girth were recorded in thirty-eight accession ranging from 9.52 cm to 32.60 cm and 0.60 cm to2.61 cm. Maximum rhizome length and rhizome girth was recorded in APAc-5 (32.60 cm & 2.61 cm) followed by APAc-9 (30.46 cm) and Raipur (2.59 cm) whereas minimum rhizome length and rhizome girth were recorded by Sunitur-4 (9.52 cm & 0.60cm) respectively. Fresh rhizome yield and dry rhizome yield hectare^{-1} ranged from 4.17 q to 62.78 q and 3.14 q to37.56 q with an average 16.42 q and 11.23 q respectively (Fig. 1 & 2). Maximum fresh and dry rhizome yield ha^{-1} was recorded by APAc-5 (62.78 & 37.56 q) followed by APAc-9 (33.53q & 27.28 q) whereas minimum fresh and dry rhizome yield ha^{-1} was recorded by Sunitur-4 (4.17 q & 3.14q) respectively. These results are in agreement with findings of Dusek *et al*. (2007); Rana *et al.* (2013); Kasture *et al*. (2015). Priya *et al.* (2017) reported the variation in the dry rhizome yield of various accessions under study, that ranged from 9.80q ha^{-1} to 16.80q ha^{-1}. Highest dry rhizome yield was recorded in Acc-3, Acc-6 & Acc-9 (16.80 q ha^{-1}).

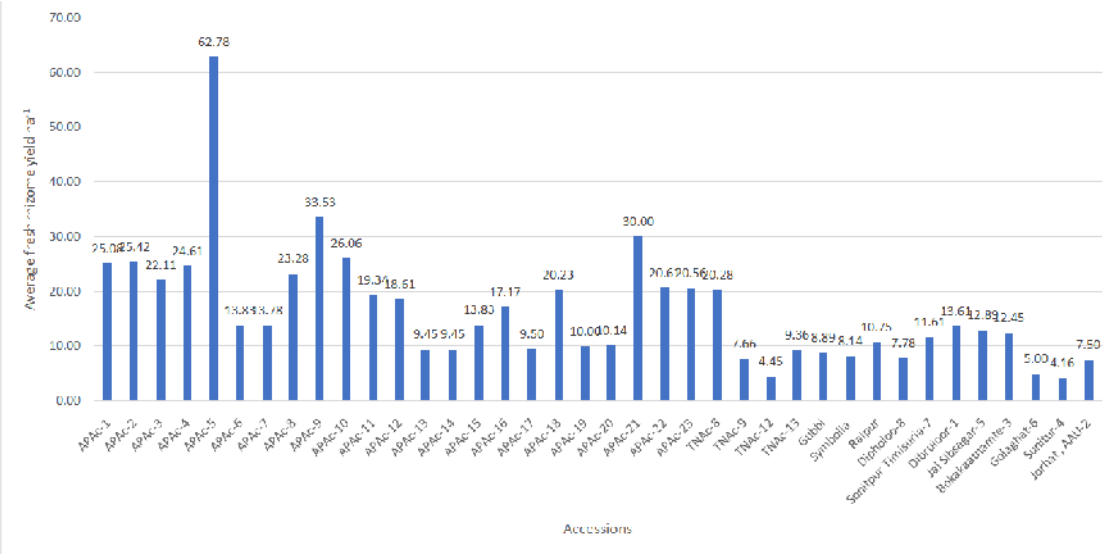

Fig. 1. Average fresh rhizome yield ha^{-1} (q) in different sweet flag accessions.

Table 1: Mean performance of sweet flag accessions for morphological parameters.

Accessions	PH	LL	LW	NL	IL	NN	NLT	NS	RL	RG
APAc-1	45.25	35.21	1.45	35.80	1.26	31.45	0.00	6.90	23.02	1.39
APAc-2	47.00	35.10	1.35	36.50	1.93	17.35	0.00	7.60	23.41	1.36
APAc-3	44.10	34.14	1.40	19.60	1.31	19.50	0.00	3.80	22.40	1.41
APAc-4	46.52	34.80	1.45	14.20	2.26	31.15	0.00	1.50	22.70	1.42
APAc-5	52.50	46.01	1.50	64.95	1.76	30.50	5.25	11.85	32.60	2.61
APAc-6	34.70	30.59	1.17	13.80	1.30	17.80	1.60	2.70	17.71	1.31
APAc-7	36.97	28.05	1.29	14.05	1.44	18.40	0.00	2.80	17.50	1.49
APAc-8	44.20	35.00	1.34	44.30	1.93	16.00	0.00	9.60	22.50	1.38
APAc-9	51.90	36.47	1.58	56.20	1.37	13.75	0.50	11.75	30.46	1.58
APAc-10	48.40	36.42	1.45	40.85	2.51	14.40	1.35	3.00	24.16	1.59
APAc-11	43.60	29.63	1.19	14.80	1.49	25.40	1.00	8.00	19.50	1.58
APAc-12	39.04	31.71	1.19	15.4	0.91	22.70	0.00	1.00	19.50	1.23
APAc-13	34.53	24.35	1.08	11.00	1.31	19.25	0.60	1.05	14.30	1.16
APAc-14	31.90	26.63	1.12	12.30	1.46	34.40	0.00	0.70	14.45	1.12
APAc-15	42.83	28.51	1.28	14.10	1.46	15.10	1.40	1.25	18.44	1.55
APAc-16	37.85	30.34	1.25	16.10	1.15	11.50	0.00	1.20	19.10	1.31
APAc-17	34.70	24.86	0.93	12.50	0.64	25.10	0.00	1.35	14.95	1.21
APAc-18	43.55	32.47	1.25	14.20	1.48	18.80	0.00	2.55	19.52	1.27
APAc-19	39.65	25.47	1.07	13.60	1.30	16.20	0.00	1.15	15.40	1.28
APAc-20	35.03	25.47	1.18	12.30	1.56	24.20	1.40	3.10	16.38	1.28
APAc-21	52.45	37.03	1.50	47.50	1.18	24.10	1.35	8.00	26.35	1.40
APAc-22	44.50	32.47	1.28	24.30	1.73	12.35	1.45	8.25	22.18	1.15
APAc-23	45.70	33.53	1.29	28.35	1.67	14.70	0.95	6.85	20.30	1.41
TNAc-8	38.27	31.81	1.27	22.70	1.33	18.85	0.00	0.50	20.13	1.15
TNAc-9	25.60	24.15	0.73	9.50	1.02	12.05	0.00	1.45	11.35	1.05
TNAc-12	32.38	21.31	0.67	9.85	1.10	19.40	2.20	2.75	9.60	1.58
TNAc-13	22.85	13.18	0.81	11.60	1.00	23.70	0.00	6.00	13.50	1.11
Gubbi	32.50	16.99	0.87	10.70	1.28	26.55	1.40	1.60	13.15	1.31
Symbolia	33.30	23.33	0.88	10.95	0.81	15.00	0.00	1.40	13.11	1.67
Raipur	34.35	26.07	1.10	12.45	1.37	17.60	0.00	1.25	16.50	2.59
Dipholoo-8	29.35	23.23	0.91	12.10	0.66	16.15	0.00	2.50	12.50	2.58
Sonitpur Timisuria-7	34.85	25.52	1.09	12.10	1.45	14.50	0.00	3.50	16.50	1.14
Dibrujoor-1	34.00	31.91	1.15	13.75	0.82	25.40	0.00	1.65	17.00	1.77
Jal Sibsagar-5	35.00	28.10	0.97	12.80	1.01	22.45	1.20	1.00	17.00	1.42
Bokakaatnamte-3	39.10	26.89	1.30	14.00	1.42	23.85	1.15	2.40	16.50	1.28
Golaghat-6	34.00	14.86	0.63	10.00	1.20	12.50	0.00	3.60	10.90	1.58
Sunitur-4	30.50	14.05	0.71	10.30	1.17	9.40	1.00	1.70	9.52	0.60
Jorhat, AAU-2	31.50	23.49	0.67	11.45	0.95	22.00	0.00	2.00	11.08	1.38
Mean	38.54	28.39	1.14	20.03	1.34	19.83	0.63	3.66	18.03	1.44
S.EM	0.22	0.19	0.01	0.42	0.01	0.18	0.03	0.10	0.16	0.01
C.D. 5%	0.63	0.56	0.02	1.21	0.03	0.53	0.09	0.27	0.46	0.03

PH- Plant height (cm) ; NL- Number of leaves; NLT- Number of lets; RG- Root girth (cm); LL- Leaf length(cm); IL-Internodal length (cm); NS- Number of sprouts; LW-Leaf width (cm); NN- Number of nodes; RL- Root length (cm)

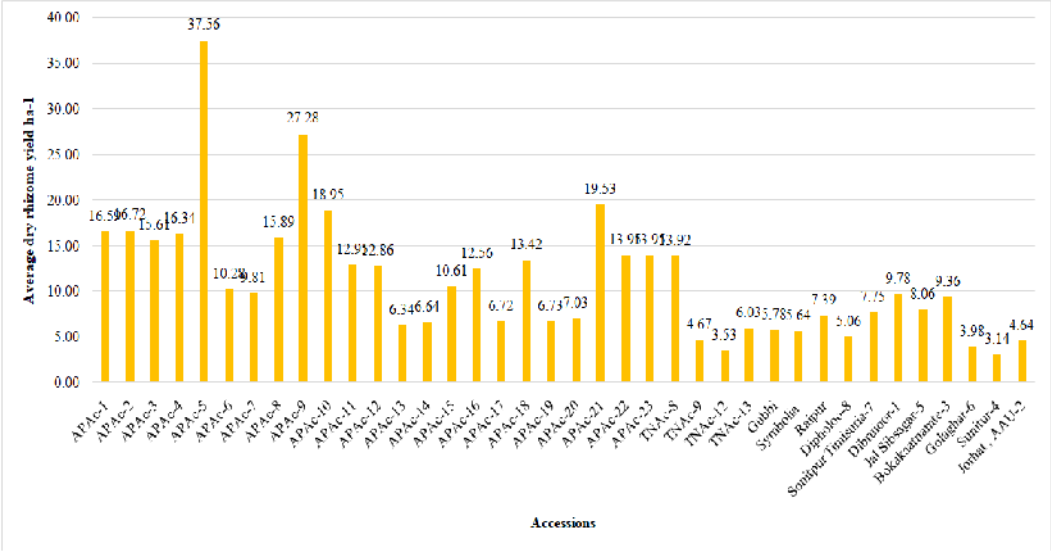

Fig. 2. Average dry rhizome yield ha^{-1} (q) in different sweet flag accessions.

CONCLUSION

Based on our findings, it was found that APAc-5 performed good interm of growth, yield and yield attributing parameters followed by APAc-9 and APAc-22. Hence these three accessions can be recommended for commercial cultivation in Andhra Pradesh and can be further utilized in the breeding programmes.

FUTURE SCOPE

The accessions which are performing best can be recommended for commercial cultivation in Andhra Pradesh and can be further utilized in the breeding programmes.

Conflict of Interest. None.

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How to cite this article: Madhuri K., Kalpana Motha, Aparna D., Sudarshana Deepa V. and Sunitha P. (2022). Performance of Sweet Flag (*Acorus calamus* L.) accessions in Andhra Pradesh. *Biological Forum – An International Journal*, *14*(3): 1488-1491.