Progress and Achievements in

Sweet Sorghum Breeding

Kharif 2018 and Rabi 2018-19

A V Umakanth

PI-Sweet Sorghum

Team

Rahuri, Parbhani, Akola, Surat, Indore, Palem, Hagari, Coimbatore, Pantnagar, Rudrur, Basanthpur, Podalkur, Vizianagaram, Deesa, Ludhiana and Hyderabad

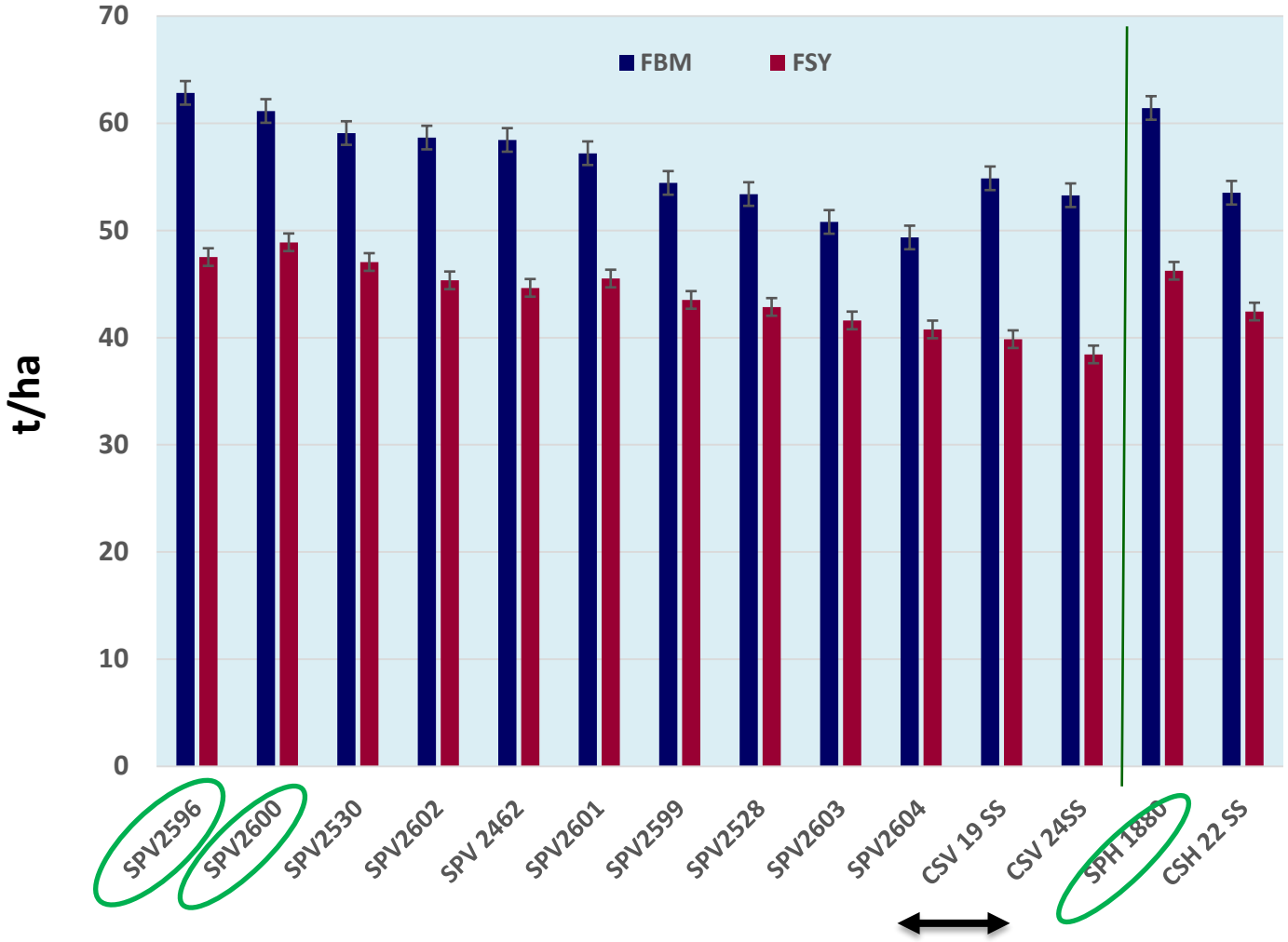
Kharif 2018 and Rabi 2018-19

S.No	Trial	Entries
Trial 1 & 2	Initial cum Advanced Sweet Sorghum Varietal and Hybrid Trial	Varieties – 15 Hybrids –1 Checks – 3
Trial 3	Identification of high biomass sorghums for lignocellulosic biofuel traits	11

Major recommendations during AGM 18

No	Recommendation	Action taken
1	SPV 2458, SPV 2462, SPV 2528, SPV 2529, SPV 2530, SPV 2531 and SPV 2402 to be tested in Advance trials	Tested in Advance trials
2	Data of Kharif locations where mean of fresh stalk yield is ≥35 t/ha should only be included in the final analysis	Complied with
3	Data of Kharif locations where mean of juice yield is ≥10,000 l/ha should only be included in the final analysis	Complied with
4	Centres should establish linkages with the sugar industries operating in their vicinity for promoting sweet sorghum for biofuels	New linkages established

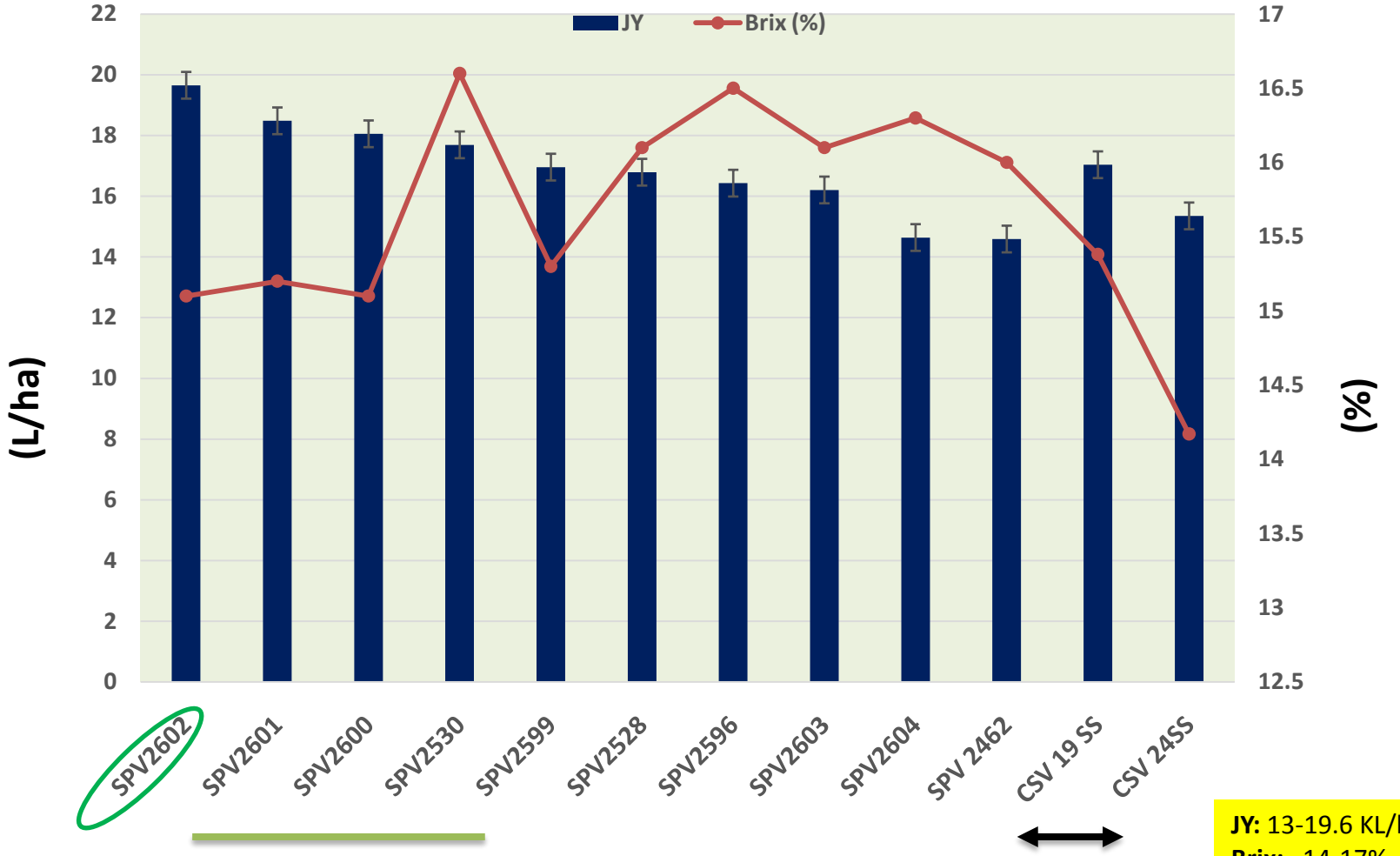
Performance of test entries for stalk traits in IASSVHT-Kharif 2018



FBM: 49-63 t/ha
FSY: 37-49 t/ha

Promising entries for fresh biomass and stalk yields: SPH 1880, SPV 2596 and SPV 2600

Performance of test varieties for juice yield and brix content - Kharif 2018



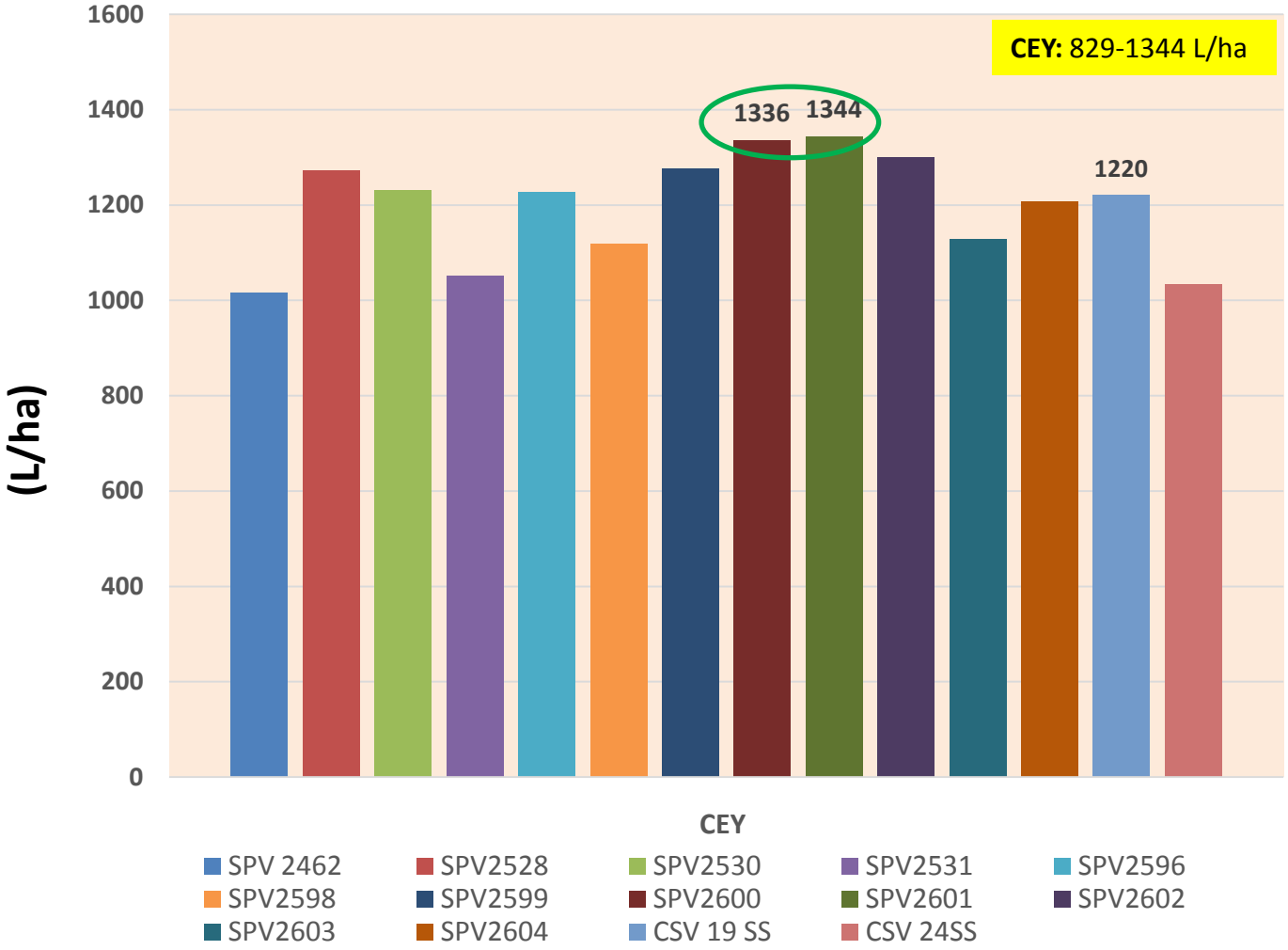
JY: 13-19.6 KL/ha
Brix: 14-17%

Promising entry for brix and juice yields: SPV 2530

Performance of test varieties for other traits -Kharif 2018

No	Entry	Juice extn. (%)	Sucrose (%)	Redu. Sug. (%)	Total sugar yield (t/ha)
1	SPV2601	30	9.97	3.97	2.53
2	SPV2600	31	9.74	4.05	2.51
3	SPV2602	33	9.48	3.51	2.44
4	SPV2599	29	9.33	3.86	2.40
5	SPV2528	29	9.72	3.33	2.39
6	SPV2530	33	9.81	4.36	2.31
7	SPV2596	30	9.51	3.67	2.31
8	SPV2604	30	9.14	4.69	2.27
9	CSV 19 SS	31	9.99	3.54	2.29
10	CSV 24SS	31	9.3	3.22	1.94
	C.D (5%)	4.0	1.0	1.1	0.59

Performance of test varieties for comp. ethanol yields -Kharif 2018

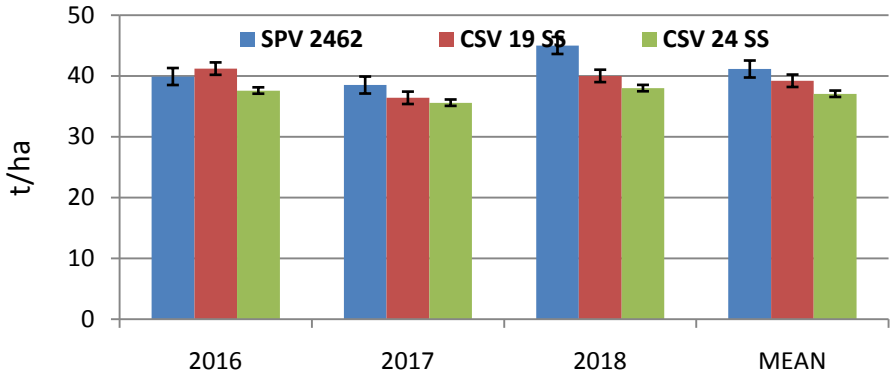


Promising entries for CEY: SPV 2600 and SPV 2601 (10% sup.)

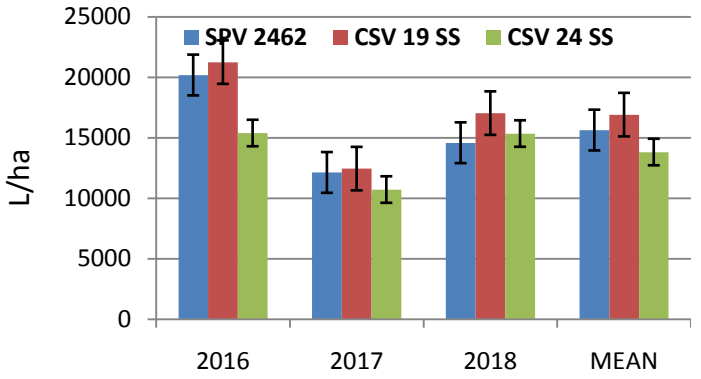
Performance of test hybrid for juice and sugar related traits - Kharif 2018

No	Entry	Brix (%)	Juice yield (l/ha)	Juice extn (%)	Sucrose (%)	Comp. ethanol yield (L/ha)
1	SPH 1880	15.6	17046	31	9.2	1225
2	CSH 22SS	15.9	18844	29	9.4	1471
	C.D (5%)	1.2	-	4.0	1.0	311

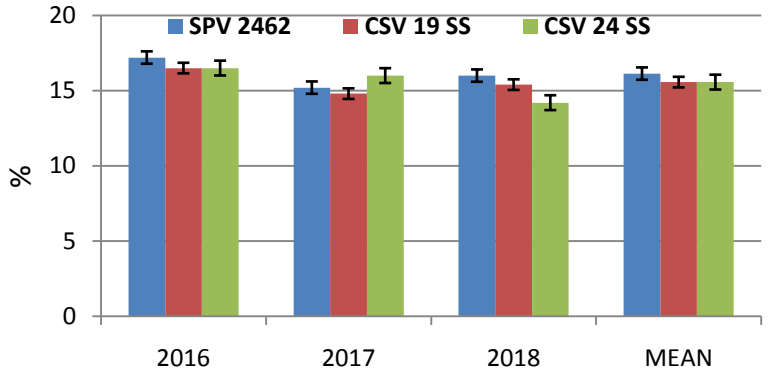
Performance of SPV2462 over three years (2016-18)



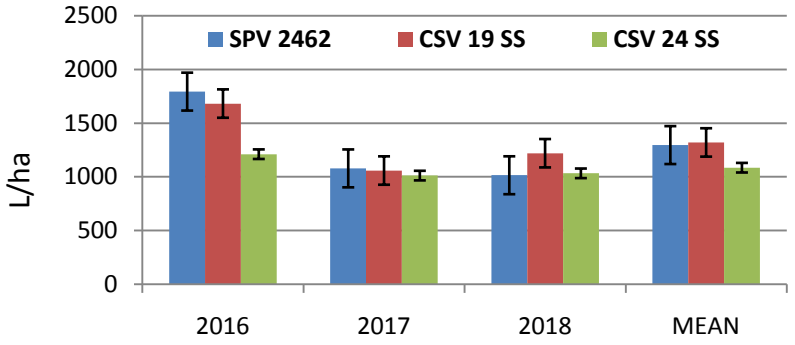
Fresh stalk yield: **5% and 11% Superiority**



Juice Yield: **-8% and 13% Superiority**

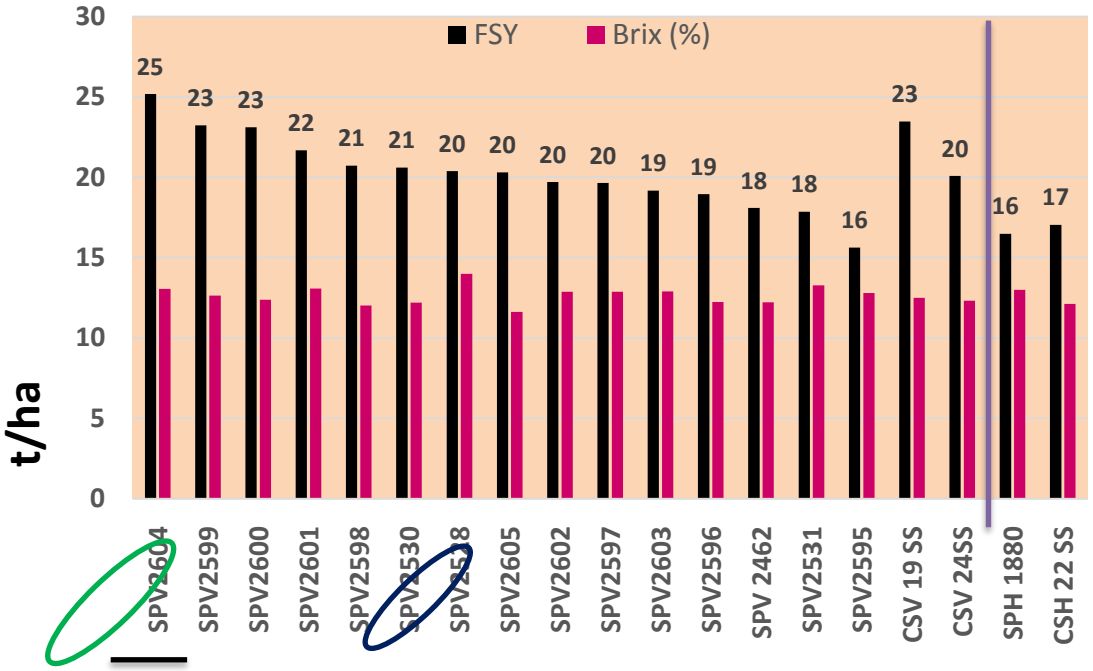


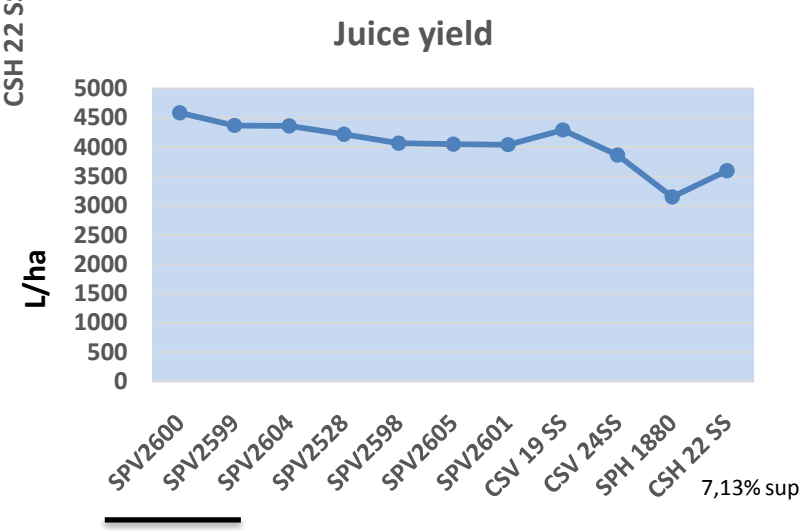
Brix: **4% Superiority**



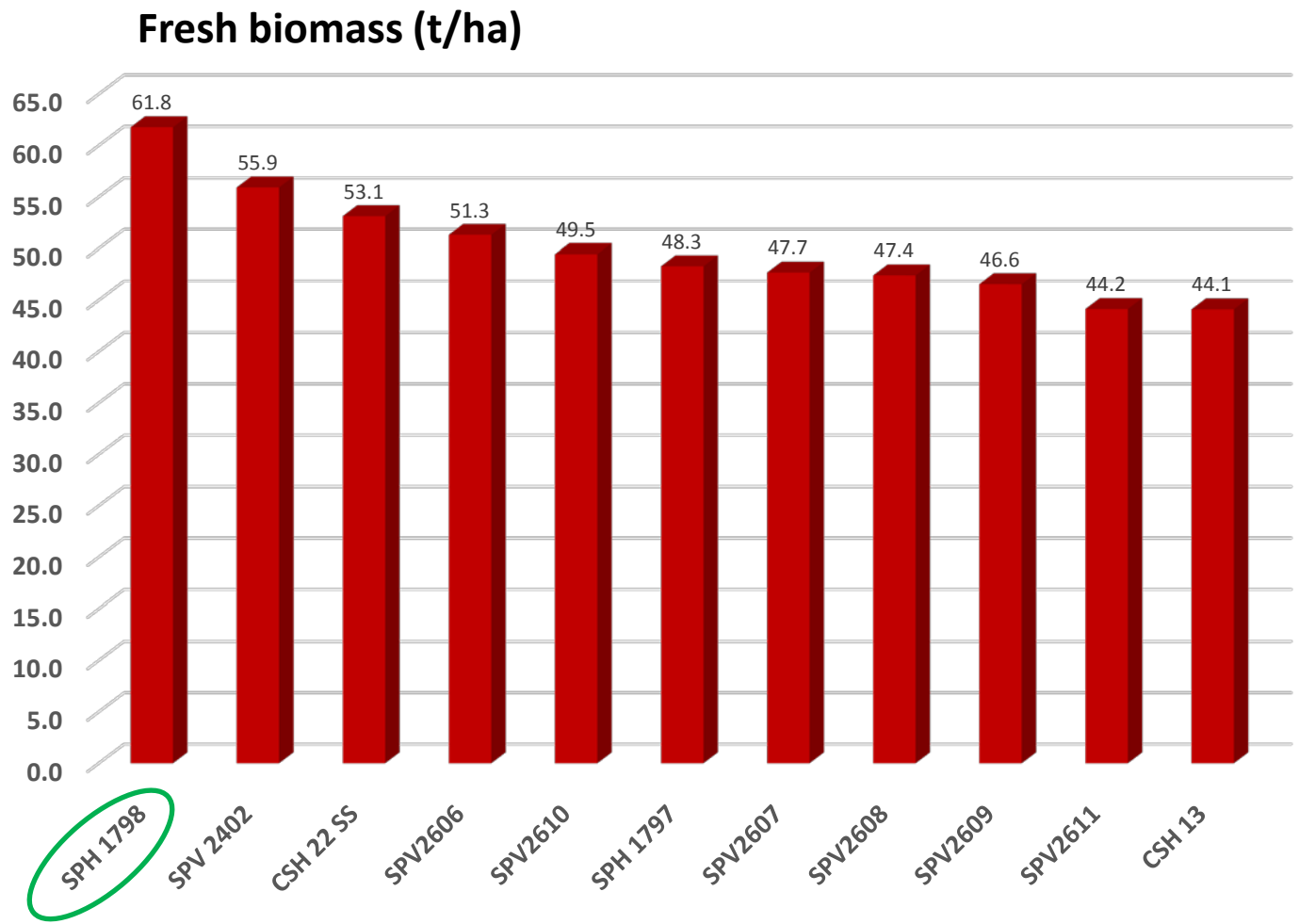
Ethanol Yields: **-2 and 19% Superiority**

Performance of entries for productivity traits - IASSVHT-rabi 2018-19



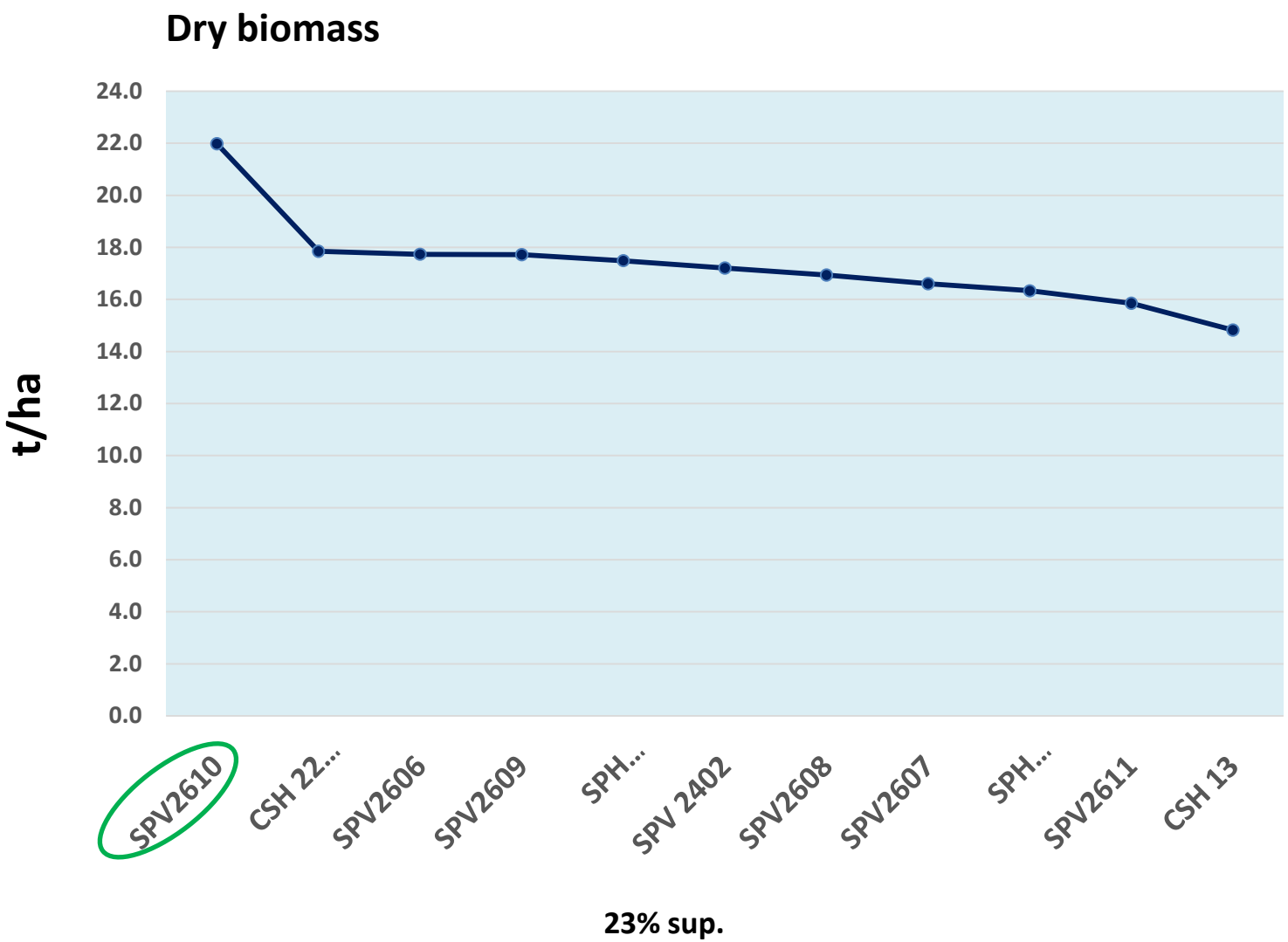


High biomass trial-Kharif 2018



16% sup.

High biomass trial-Kharif 2018



23% sup.

Season-wise conclusions

Kharif

- **Total biomass, fresh stalk and computed ethanol yields:** SPV 2596 and SPV 2600 were superior to both the checks.
- SPV 2530 was promising for a range of characters like brix, juice yield, total sugar yields and computed ethanol yields.
- SPV [illegible] also promising for shoot fly tolerance.

Rabi

- **Fresh stalk yield, brix, juice yield and comp. eth. yields:** SPV [illegible]

HBM

- **Fresh Biomass yields:** SPH 1798 and SPV 2402
- **Dry Biomass yields:** SPV 2610

Overall Conclusions

1. With respect to total fresh biomass and fresh stalk yields, SPV 2600 performed consistently across seasons
2. For juice yield, the varieties SPV 2599 and SPV 2600 exhibited consistent superiority over both the seasons
3. SPV 2528 and SPV 2531 performed consistently across seasons for high brix (%)
4. SPV Nos 2528, 2600 and 2601 were superior to check for total sugar yields and computed ethanol yields during both kharif and rabi seasons
5. SPV 2600 is promising for both seasons for most of the characters

Publications

Anil Kumar, G.S., Vinutha, K.S., Devendra Kumar Shrivastava, Jain. S., Syed, B.A., Gami, B., Marimuthu, S., Yuvraj, A., Yadava, H.S., Srivastava, S.C., Yadagiri, K., Ansodariya, V., Prasuna, P., Vishwanath, J., Anand, S.R., Abhishek Rathore, Umakanth, A.V., Srinivasa Rao, P. 2018. Identification of ideal locations and stable high biomass sorghum genotypes in semiarid tropics. Sugar Tech. https://doi.org/10.1007/s12355-017-0584-9 (JrnID: S086; IF: 6.81).

Umakanth, A.V., Jadhav, A.S., Nimbkar, N., Ghorade, R.B. and Tonapi, V.A. 2019. Potential of Indian sweet sorghum genotypes for biofuel production. Abstracts of the International Symposium- Innopreneurship: A need of sustainable agriculture (ISINSA2019), Feb 2-3, 2019, CCS-HAU, Hisar. pp 235-236.

Umakanth, A.V. and Tonapi, V.A. 2018. Sweet sorghum as an excellent single-cut forage crop. Book of Abstracts, 1st National Genetics Congress on "Genetics for Sustainable Food, Health and Nutrition Security", December 14-16, 2018, ICAR-Indian Agricultural Research Institute, New Delhi 110012. pp 99

Avijit Dey, Paul, S.S., Umakanth, A.V., Venkatesh Bhat, B., Lailer, P.C. and Punia, B.C. 2018. Invitro fermentation kinetics, methanogenesis, enzyme activities and gas production potential of newly developed sorghum (Sorghum bicolor (L.) Moench) cultivars in buffalo. Proceedings of the IX Asian Buffalo Congress-climate resilient Buffalo production for sustainable livelihood, Feb 1-4, 2018, ICAR-CIRB: pp 68-69.

.Riyazaddin Mohammed, Ashok Kumar Are, Rajendra S. Munghate, Anil Gaddameedi, Kavi Kishor Polavarapu Bilhan, Hari C. Sharma. 2018. Pattern of genetic inheritance of morphological and agronomic traits of sorghum associated with resistance to sorghum shoot fly, Atherigona soccata. Euphytica (2018) 214:32 https://doi.org/10.1007/s10681-018-2111-9

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Are Ashok Kumar. 2018. Sorghum Hybrids Development for Important Traits: Progress and Way Forward. doi:10.2134/agronmonogr58.2014.0059 © ASA and CSSA, 5585 Guilford Road, Madison, WI 53711, USA. Sorghum: State of the Art and Future Perspectives, Ignacio Ciampitti and Vara Prasad, editors. Agronomy Monograph 58.

Sweet sorghum work plan for 2019

1. **Identification of sweet sorghum genotypes for high stalk & sugar yields combining with shoot pest and foliar disease tolerance**

2. **Characterizing high biomass sorghums for biomass quantity and composition for their utility as second generation biofuel feedstock**

3. **Liaison with the industry for promoting sweet and high biomass sorghums as effective feedstocks for biofuel production**

Current Industrial Partners

Green Petal Infra & Resources Private Limited, Vijayawada, Andhra Pradesh

Sweet sorghum is being promoted as a feedstock for producing sorghum syrup and ethanol