

*Full Length Research*

# Evaluation of Sowing date and Harvesting Ages of Some Sugar Beet (*Beta vulgaris* subsp. *vulgaris*) Cultivars under Guneid conditions, (Sudan)

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Five sugar beet cultivars; Brigitta, Laetitia, Esperanza, Henrike and Progress were grown with three adapted cultivars namely, Juvena, Mashad, and Valentina at the Sugarcane Research Centre, Guneid. The objectives of these trials were to study the effects of three sowing dates namely, Aug. 20, Sept. 20 and Oct. 29 and six harvesting age intervals of 4.5, 5.0, 5.5, 6.0, 6.5 and 7.0 months, respectively. The experiment was laid out in a randomized complete block design with three replications. The results showed that, the first sowing date Aug. 20 prolonged vegetative growth, and maturity was attained at age of 6 months; the second Sept. 20 and third Oct. 20 sowing dates were best; and maximum sucrose content was attained at ages 4.5 and 5 months, respectively. Beet cultivars Valentina, Esperanza and Progress maintained reasonably high sucrose levels till age 5.5 (Mar. 30 harvests) as the adapted cultivar Juvena. Best harvesting date was early Feb. to early March. For all beet varieties tested there was a severe decline in sugar content at age older than 6 months.

**Keywords:** Sugar beet, *Beta vulgaris*, sowing dates, harvesting age.

## INTRODUCTION

Sugar beet *Beta vulgaris* subsp. *vulgaris* [Caryophyllales: Amaranthaceae] is a member of the chenopodiaceae subfamily, and is largely a temperate climate crop; whose roots contains high concentrations of sucrose and is successfully grown on a commercial scale for sugar production in virtually all areas of the world with latitudes in excess of 30° where winters are not excessively harsh. Sugar beet contributes about 25-30% of the world's sugar production which currently stands at slightly above 140 Million metric tonnes the rest 70 to 75% comes from sugarcane *Saccharum officinarum* L. (Francis 2006, and Licht 2004). In recent years heat tolerant tropical varieties have been evolved; and field tests on some of these varieties that, have been introduced into the Sudan had been on-going in Guined, (Sudan) since early 2000. However, several aspects of their agronomy, husbandry and protection status remained largely unexplored. Therefore, trials on the

adaptability of some sugar beet cultivars under different sowing and harvesting date regimes were undertaken so as to answer some of these problems for the successful cultivation of sugar beet under conditions of the Sudan Gezira; and results are, presented.

## MATERIALS AND METHODS

This study was conducted at Sugarcane Research Center, Guneid located approximately at latitude 15°N, longitude 33°E, for two seasons from 2008/09 to 2009/10. The soil at the experimental site is vertisol, with about 64% clay, 0.09% N and 2-8 ppm available P; and, alkaline in reaction with pH 8.2; and mean annual rainfall of 112 mm falling mainly in July and August.

**Table 1:** Sucrose content (pol %) for the different beet varieties for the first sowing date 20/8/2008 (Season 2008/09).

Varieties	Date of analysis					
	5/1/2009 4.5 month	20/1/2009 5 month	5/2/2009 5.5 month	22/2/2009 6 month	8/3/2009 6.5 month	22/3/2009 7 month
Juvena	12.07	16.01	15.24	15.47	13.58	12.14
Mashad	11.72	13.91	13.55	15.28	13.33	10.99
Valentina	6	13.13	13.83	15.64	12.96	11.85
Laetitia	10.68	11.86	13.31	13.99	11.09	9.19
Brigitta	11.94	13.99	14.93	16.15	11.53	11.08
Esperenza	11.07	12.75	15.55	15.01	12.3	10.66
Henrike	12.86	14.13	16.01	16.77	14.53	12.51
Progress	11.31	12.47	13.75	14.43	12.98	10.05
Mean	11.57	13.53	14.52	15.34	12.79	11.06
SE ±	0.71	0.72	0.61	0.77	0.82	0.57
CV %	0.07	0.06	0.05	6.22	7.94	6.30
LSD (0.05)	1.52	1.55	1.12	1.67	1.77	1.22

**Table 2:** Sucrose content (pol %) for the different beet varieties for the second sowing date 20/9/2008 (Season 2008/09).

Varieties	Date of analysis					
	7/2/2009 4.5 month	25/2/2009 5 month	11/3/2009 5.5 month	25/3/2009 6 month	9/4/2009 6.5 month	23/4/2009 7 month
Juvena	13.92	13.72	13.31	13.28	13.15	11.50
Mashad	14.05	13.63	13.92	13.58	15.64	13.20
Valentina	15.01	13.94	15.09	12.34	14.86	13.19
Laetitia	15.83	15.65	14.95	14.70	13.95	12.02
Brigitta	14.47	13.85	13.31	13.87	13.78	12.15
Esperenza	13.66	13.94	13.59	12.88	13.96	10.87
Henrike	13.87	13.56	13.58	12.43	13.71	11.57
Progress	14.29	14.63	15.33	13.63	15.74	13.85
Mean	14.39	14.15	14.13	13.34	14.35	12.29
SE ±	1.20	1.15	1.13	1.65	1.59	1.31
CV %	0.10	9.98	9.80	15.23	13.67	13.08
LSD (0.05)	2.58	2.47	2.42	3.55	3.42	2.81

### Seedbed preparation and planting materials

The land was prepared by a disc plough then harrowed, leveled and ridged; the spacing between ridges and holes/hills were 75 cm and 15 cm respectively. Five sugar beet varieties namely, Brigitta, Laetitia, Esperenza, Henrike and Progress were tested. Three adapted beet varieties which have been undergoing tests since early 2000 namely, Juvena, Mashad, and Valentina were included as checks. Plot size was 6 ridges of 8 meter length.

### Sowing of beet seeds

Two monogerm beet seeds were sown per hill with 15 cm between hills, this was later thinned to one plant/hill giving about 53 plants per row and an average plant population of (about 37,000)

plants/feddan (1 feddan= 0.83 ha) and the trial was irrigated every 10 days. Three sowing dates (a) 20/8/2008, (b) 20/9/2008 and (c) 29/10/2008 were tested; and plots of each experiment was harvested at the various crop ages of 4.5, 5.0, 5.5, 6.0, 6.5 and 7.0 months respectively. Urea fertilizer was applied at the rate of 150 kg/feddan as for sugarcane and weeding was done as required, the trial was arranged in a randomized complete block design with four replications. Analyses of variance appropriate for the design were applied and mean separation was done using Duncan's multiple range tests.

### RESULTS AND DISCUSSION

The sugar content (pol%) of beet roots for the three sowing dates are given in (Tables. 1, 2 and 3) and all varieties gave very low sugar content at age 4.5

**Table 3:** Sucrose content (pol %) for the different beet varieties for the third sowing date 29/10/2008 (Season 2008/2009).

Varieties	Date of analysis					
	19/2/2009	5/3/2009	30/3/2009	15/4/2009	30/4/2009	15/5/2009
	4.5 month	5 month	5.5 month	6 month	6.5 month	7 month
Juvena	14.30	15.52	14.14	13.34	13.38	11.72
Mashad	11.98	13.76	13.12	12.10	11.00	11.31
Valentina	14.45	15.67	13.75	14.54	13.52	12.22
Laetitia	12.29	14.72	12.31	12.58	11.98	10.89
Brigitta	12.24	12.96	12.06	11.26	9.98	9.96
Esperenza	12.61	13.77	13.72	12.82	11.61	10.75
Henrike	11.82	14.31	12.63	11.39	10.82	10.61
Progress	13.17	13.46	13.35	11.83	11.83	11.10
Mean	12.86	14.27	13.14	12.48	11.7	11.0
SE $\pm$	0.92	0.93	0.988	1.53	1.02	1.19
CV %	9.16	7.79	9.21	15.07	10.70	13.18
LSD <sub>(0.05)</sub>	2.06	1.99	2.12	3.29	2.20	2.55

**Table 4:** Sucrose content (pol %) for the different beet varieties for the first sowing date 20/8/2009 (Season 2009/2010).

Varieties	Date of analysis					
	5/1/2010	20/1/2010	5/2/2010	22/2/2010	8/3/2010	22/3/2010
Henrike	12.59	15.45	13.09	15.64	13.86	13.09
Valentina	10.57	10.79	11.25	14.29	12.42	11.11
Mashad	10.94	12.62	11.59	13.05	13.65	11.91
Brigitta	11.35	11.9	12.25	12.91	12.59	11.95
Latitia	10.89	12.19	11.67	12.56	12.78	11.46
Juvena	11.41	12.27	11.84	14.4	13.93	13.89
Esperenza	11.57	11.08	11.90	13.55	13.46	12.61
Progress	10.91	13.02	11.53	14.55	13.3	12.55
CV %	5.62	3.92	7.94	8.91	9.23	14.50
SE $\pm$	0.51	0.39	0.77	1.01	0.99	1.46
LSD <sub>(0.05)</sub>	1.11	0.85	1.65	2.16	2.14	3.13

months indicating immaturity. At the second harvest age of 5 months cultivars Juvena, showed a remarkable increase in pol% followed by Henrike, Briggita and Mashad. There was gradual increase in sucrose content from age 4.5 to 6 months where six out of the eight varieties reached their maximum. Variety Esperanza reached its maximum sucrose content at age 5.5 (Feb. 2 harvest). Juvena kept high sucrose levels between 5-6 months of age. Beyond the age of 6 months (March 3 harvest) there was a rapid deterioration and decrease of sugar content and juice quality. If crops are planned for late harvests, Armstrong *et al.* (1986) suggested that where it is dry and bright throughout the harvest period, as in most tropical countries; it is advisable to irrigate until a fixed period of 6-7 weeks before harvest.

In the second sowing date (Table. 2) varieties Juvena, Mashad, Valentina, Laetitia, Brigitta and Henrike reached their maximum sucrose content at age 4.5 months (5 Feb harvest); and in the third sowing date (Table 3.) Progress gave the highest sucrose content at age 5.5 (late maturity). Laetitia maintained a high sucrose content till age 5.5 months (March 10 harvest). Thereafter, there was a gradual deterioration till age 6.5 month (March 25-9 April); and then a rapid deterioration at age 7 months (April 23 harvest). A similar trend in sugar content for the various sugar beet varieties and different analysis dates also persisted for the second season 2009/10, and are annotated in tables 4, 5 and 6, respectively.

**Table 5:** Sucrose content (pol %) for the different beet varieties for the second sowing date 20/9/2009 (Season 2009/2010).

Varieties	Date of analysis				
	7/2/2010	25/2/2010	11/3/2010	25/3/2010	9/4/2010
Henrike	13.12	14.01	14.41	15.04	13.93
Valentina	11.39	12.40	13.22	12.03	11.23
Mashad	11.89	12.30	13.21	13.07	11.45
Brigitta	11.55	11.13	12.95	12.18	12.19
Latitia	11.10	11.81	13.75	10.91	10.54
Juvena	11.74	12.14	14.22	13.05	11.04
Esperenza	10.31	12.53	12.55	12.43	12.04
Progress	10.65	11.81	13.40	13.51	11.59
CV %	10.92	6.71	12.78	9.65	12.47
SE ±	1.02	6.72	1.40	1.00	1.19
LSD <sub>(0.05)</sub>	2.19	1.44	3.01	2.16	2.56

**Table 6:** Sucrose content (pol %) for the different beet varieties for the third sowing date 29/10/2009 (Season 2009/2010).

Varieties	Date of analysis			
	19/2/2010	5/3/2010	28/3/2010	12/4/2010
Henrike	14.08	10.84	15.17	13.59
Valentina	11.30	14.25	11.25	12.61
Mashad	10.78	11.00	13.37	13.62
Brigitta	10.37	13.12	13.64	12.73
Latitia	11.53	12.72	12.57	10.55
Juvena	11.45	13.35	14.40	12.47
Esperenza	12.21	10.17	13.23	11.97
Progress	12.44	12.38	13.00	12.75
CV %	8.88	18.28	9.42	10.81
SE ±	0.85	1.82	1.02	1.10
LSD <sub>(0.05)</sub>	1.83	3.91	2.19	2.37

## CONCLUSIONS

From the above results we can therefore, conclude that:-

- (1) The time of harvest has a strong effect on beet sugar content with early February to early March being the prime time of harvest for the sowing dates of August to October under the conditions of this experiment.
- (2) All the varieties behaved similarly, except that, some varieties were less prone to rapid sugar deterioration.
- (3) All the varieties tested showed severe decline in sugar content at the age older than 6 months indicating over maturity beyond this age.

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