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Summer Guar: A New Concept for Enhanced Production and Improved Gum Quality

Guar is a deep rooted, drought hardy, summer annual legume of great economic significance. It is recognized as an international, export oriented, cash crop due to industrial uses of guar gum obtained from seed endosperm. Ecologically, it has remained confined to very specific habitats of arid districts of Rajasthan, Haryana and Gujarat. However, sudden spurt in price of guar gum from December 2011 onwards probably due to many folds increase in demand from USA for oil fields, have attracted the attention of corporate world, new and non-traditional farmers, traders and seed companies through out the country. Therefore, need was felt to introduce this crop in non-traditional regions and season(s). Thus, attempt was made to grow guar in summer 2012 under irrigated conditions, so as to exploit the possibility of cultivating suitable variety for summer season on arid soils.

Promising genotypes of guar, (RGC-986, RGC-936, RGC-1066, RGC-936-1-5-1, HG-884 and HG-563) were evaluated during rainfed conditions of kharif 2011 and under irrigated conditions of summer 2012. Experimental details during both the seasons were as follows:

Kharif 2011: Six genotypes of guar were planted on 18 July, 2011 after 30 mm rainfall. Each genotype was adjusted in 4 rows of 5 m length at inter row spacing of 40 cm apart (8.0 m² net plot area), in randomized block design with three replications. No fertility or plant protection measures were

adopted. Total rainfall during July to October, 2011 was 458.20 mm, RH ranged from 61.1 to 83.7%, minimum temperature from 19.3 to 27.6°C, maximum temperature from 32.8 to 37.1°C and, ET from 4.4 to 6.2 mm/day. Almost equal number of plants were maintained in each plot. Inter culture operations were done as per requirements and the crop was harvested on 15 November, 2011.



Guar crop at Ranga Reddi District (AP) during kharif 2012

Summer 2012: Six genotypes were planted on 24 February, 2012 with a pre-sowing irrigation of 5 cm. The plot size, inter-spacings, design and replications were same as during kharif 2011. The agronomic practices were also the same as aforesaid except 4 flood irrigations of 5cm each were applied at 20 days interval. Equal number of plants (300-320) were maintained for each variety in each of three replications. Harvesting was done on 30 May 2012. Total rainfall during cropping season was 32.5

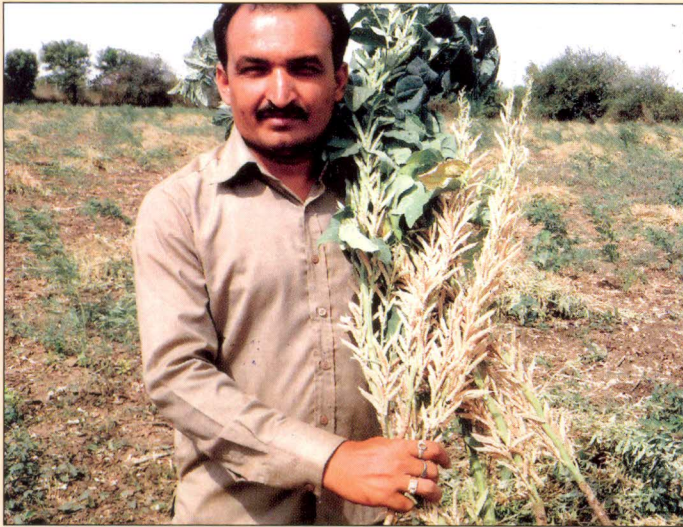
mm, maximum and minimum temperature ranged from 15.0 to 27.4 and from 26.4 to 40.7°C; RH from 45.3 to 51.2% and, ET from 5.2 to 12.7 mm/day.

Across the genotypes, the maturity period was reduced by about 10 days in summer season (76.11 days) over kharif (87.05 days). In the former season, RGC-1066 (81.94 days) and in kharif season RGC-986 (93.33 days) took maximum time to mature. Across the genotypes, plant height decreased by about 29.72 cm in summer season (45.88 cm) over rainy season crop (75.6 cm). However, number of pods/plant (62.01) and number of seeds/pod (8.09) during summer season were statistically higher compared to kharif season (54.68 and 6.86, respectively). HG-884 (66.27) during kharif and HG-563 (68.00) during summer season had maximum number of pods. Thus, higher number of pods/plant and grains/pods also positively influenced grain yield during summer season.



Summer Guar during 2012 at CAZRI (Var. RGC- 1066) reflecting high harvest index

High yields in summer season could be due to complete absence of diseases like 'Bacterial leaf blight', 'Alternaria leaf spot' and 'Powdery mildew' in summer season due to clear sky, low humidity (45-51%) and high atmospheric temperature (35-40°C) as these diseases cause considerable yield losses in rainy season. Secondly, as moisture supply was limited the weeds were completely removed by 3 intercultural operations during summer. It is worth mentioning that such high yield potentials were obtained even without applications of fertilizers and adopting plant protection measures. The only required input was 4 irrigations of 5 cm each at 20 days intervals. Possibilities of extremely high yields



Summer guar during May 2012 at Digras, Yavatmal, Maharashtra

Results presented on grain yield, gum content, gum yield and viscosity of 6 genotypes of guar during kharif and summer seasons appeared quite encouraging (Fig 1, 2 & 3). For instance, grain yields when assessed across the genotypes were almost three times more in summer (1520.5 kg/ha) over kharif season (505.0 kg/ha). Grain yield ranged between 482.81 (HG-563) and 546.25 kg per hectare (RGC-936 during rainy season however, it showed wide range during summer season, being minimum (1021 kg/ha) in unbranched and late growing RGC-1066 to as maximum as 1916.67 kg/ ha in RGC-936-1-5-1 (Fig. 1).

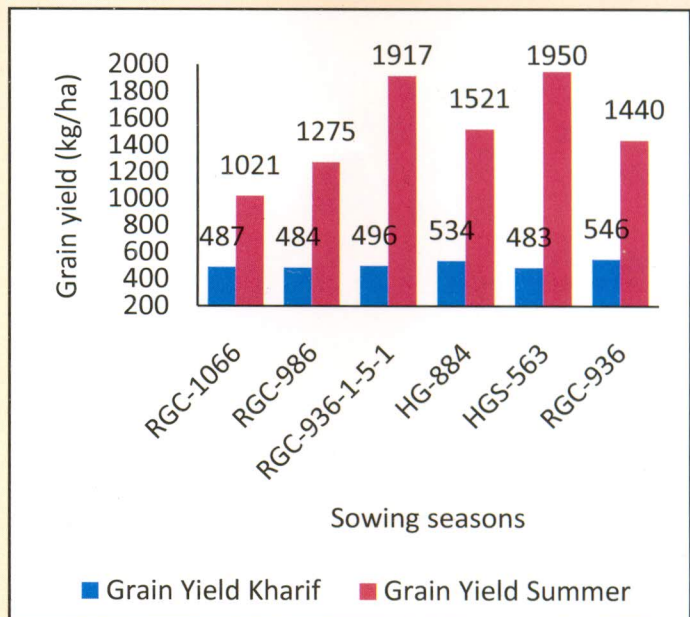


Fig 1: Grain yield during kharif 2011 and summer 2012.

(2.5 to 3.0 times in summer season over rainy season) in arid soils have opened new avenues for enhanced guar production in the canal command area also, and hence fitting this legume in guar-mustard-guar or early wheat-guar-rice sequence on irrigated arid and semi-arid soils, respectively. Thus, a new concept of cultivating guar [*Cyamopsis tetragonoloba* (L) Taub] in summer under irrigated conditions of arid and semi-arid regions may be introduced. The system will enhance grain yield by 2.5 to 3.0 times, gum content by 1.7%, guar gum yield by 320 kg ha⁻¹ and viscosity of gum by 339 cP. This farming concept will enhance exportable guar gum production in India. These reports and results are justified by successful guar crop cultivation by many farmers during summer 2012 in Rajasthan, Haryana, Chatisgharh, Madhya Pradesh and Yavatmal (Dragis) areas (personal communication). High grain yield and high gum content obtained in summer season ultimately increased guar gum yield by about 320 kg ha⁻¹ more, which may pay high dividends to guar industries. Earlier reports also indicated accumulation of high gum content in dry regions over wet regions. Viscosity (cP) of guar gum determines use of guar gum in food industries or other industries like oil fields. However, it is difficult to increase viscosity genetically and also by inputs management. Interestingly, summer season associated with stress factors appreciably increased viscosity of guar gum by about 339 cP. For instance, average 3262.3 cP in rainy season increased to 3601.6 cP in summer season. At the varietal level also, RGC-936, a national early check, maintained very high viscosity profile (4600 cP), followed by late maturing tall growing single stem genotype RGC-1066 (3639 cP) (Fig. 3).



Performance of Var. RGC-936 during summer 2012 at CAZRI, Jodhpur

Thus, shifting guar cultivation in summer season will enhance guar yield and improve its quality of 4-5 irrigations are available. Hence, it is new concept of farming system that encourages taking two crops every years in arid and semi-arid regions.

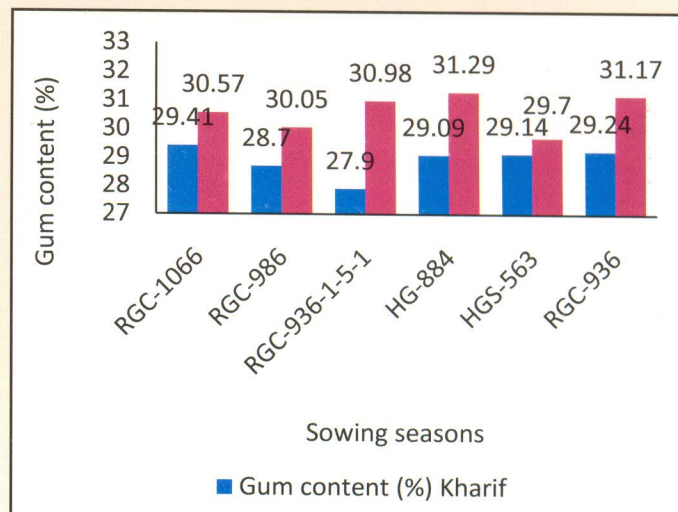


Fig 2: Gum content during kharif 2011 and summer 2012.

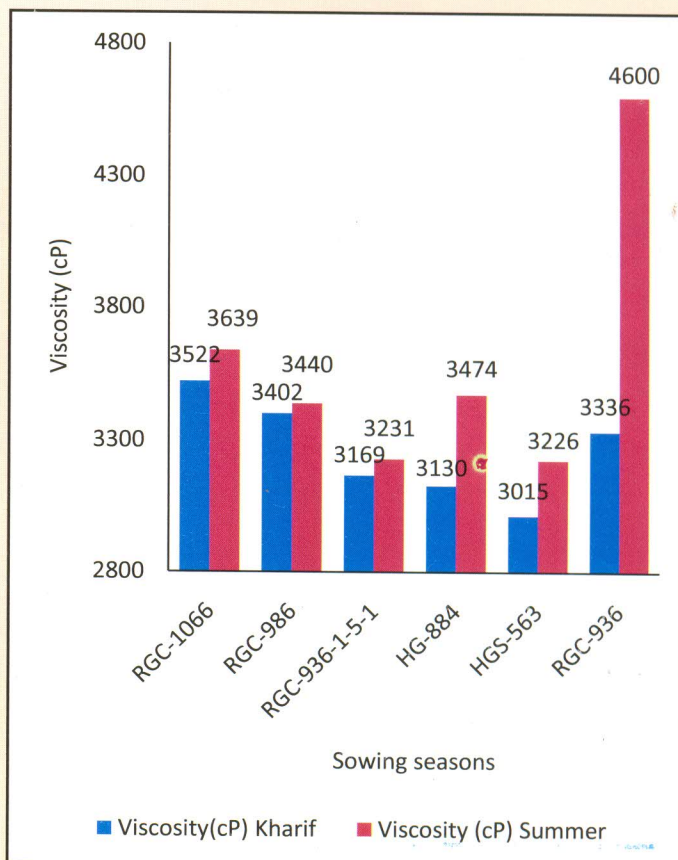


Fig 3: Viscosity during kharif 2011 and summer 2012.

D.Kumar, K.S.Solanki and Omvir Singh

Visit Abroad

Dr. A.S. Sirohi, Amman (Jordan), from 3.2.2013 to 14.2.2013 for attending specialized training course on Integrated Crop and Livestock Production: Special focus on Small Ruminants.

Dr. Shalander Kumar, Beijing (China), from 18.3.2013 to 21.3.2013 for attending International Dryland Development Conference on Global Climate Change and its Impact on Feed and Energy Security in the Drylands .

Dr. M.M. Roy, Amman (Jordan), from 21.5.2013 to 23.5.2013 for participation in CGIAR Research Programme on Dry Land Systems.

Dr. M.M. Roy, Ghent (Belgium), from 17.6.2013 to 19.6.2013 for attending final meeting of UNESCO Project on "Sustainable Managements of Marginal Drylands (SUMMAD)".

Dr. M.M. Roy, Kathmandu (Nepal), from 26.8.2013 to 28.8.2013 for attending workshop on "South Asia Target Regional Implementation and Partnership".

Dr. S.P.S. Tanwar, Colombo (Sri Lanka), from 26.8.2013 to 30.8.2013 for attending workshop on Developing Farming Systems for Climate Change Mitigation.

Dr. M.M. Roy, Sydney (Australia), from 15.9.2013 to 19.9.2013 for participation in International Grassland Congress and International Rangeland Congress.

Dr. H.R. Mahalla, Michigan State University (USA), from 23.8.2013 to 23.11.2013 for attending 4 months training on Marker Assisted Selection (NRM).

Dr. P. Santra, ISRIC, Wageningen (Netherlands), from 14.9.2013 to 14.12.2013 for attending 4 months training on Geo-Informatics (NRM).

Dr. Suresh Kumar, Palermo (Italy), from 28.10.13 to 31.10.13, deputed for attend the VIII International Cactus peer and Cochinear symposium.

Dr. N.D. Yadav, Amman (Jordan), from 27.10.13 to 14.11.2013 deputed for attending course on "Improving water productivity in Agricultural systems" under ICAR-ICARDA Collaborative research project.

Recent CAZRI Publications (Hindi)

Suskha Shetra main Tinda Utpadan Prodhyogiki. Eds: Birbal, Rathore, V.S., Nathawat, N.S., Soni, M.L. and Yadava, N.D. 27p. 2013, CAZRI, Jodhpur.

Shuska Shetro main Krishi ki Unnat Taknikiyan. Eds: Misra, A.K., Haridayal and Roy, M.M. 196p. 2013, CAZRI, Jodhpur.

Matira Misrit Kheti Suskha Shetra ke Liye Vardan. Eds: Mahela, Hansraj and Singh, Jaiprakash. 2013, CAZRI, Jodhpur.

Mausam Adarit Krishi Salah Kaise Prapat Kare. Eds: Singh, D.V. and Punia, Surendra. 2013, CAZRI, Jodhpur.

Mehandi ki Kheti Suskha Shetra main Aik Labkari Udham. Eds: Jagid, B.L., Regar, P.C., Rao, S.S., Khemchand, Roy, P.K., Singh, Y.V. and Sukla, Monika. 2013, CAZRI, Jodhpur.

Khejri: Kit va Rogo se Suraksha. Eds: Singh, M.P. and Lodha, Satish. 2013, CAZRI, Jodhpur.

Forthcoming Conferences and Events

Research on Responses to Land Degradation and Desertification from 17-18 March 2014 at Berlin, Germany. Contact: http://eusoils.jrc.ec.europa.eu/events/Future_events/LEDDRA.pdf

Soil Change Matters from 24-27 March 2014 at Bendigo, Victoria, Australia. Contact: <http://www.soilmatters.org/>

Green Carbon Conference from 1 to 3 April 2014 at Brussels, Belgium. Contact: <http://www.green-carbon-ca.eu/>

Second International Conference on Remote Sensing and Geo-information of Environment from 7-10 April 2014 at

Paphos, Cyprus.

Contact: <http://www.cyprusremotesensing.com/rscy2014>

Digital Soil Mapping Training Workshop from 22- 24 April 2014 at Sydney, Australia. Contact: http://eusoils.jrc.ec.europa.eu/events/Future_events/DSM_Workshop_2014.pdf

Second International Conference on Sustainable Solid Waste Management from 12-14 June 2014 at National Technical University of Athens, Greece. <http://www.athens2014.biowaste.gr/>

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