

Introduction

Sorghum is the most important food and fodder crop of dry land agriculture. Sorghum grains are important as food and as livestock feed. The stem and foliage are used as a green fodder, hay, silage and pasture. The stems are also used as fuel and building material.

Sorghum is used in preparation of different types of food and unleavened bread is the most common food made from sorghum flour. The dough is sometimes fermented before the bread is prepared, and the grains boiled to make a porridge or gruel. It is also used in the preparation of biscuit. Beer is prepared from sorghum grain in many parts of Africa.

Though sorghum is known for its versatile use, hardiness, dependability, stability of yield and adaptability over wide range of climate, the edapho-climatic conditions in the sorghum growing areas of the world limit the crop production. The crop is often grown in poor soil soils by farmers who have little resources for control of moisture and purchase of fertilizers, insecticides and other inputs. Therefore, there is a need for the development of cultivars more adoptable to the adverse climatic conditions of the semi-arid tropics.

Sorghum is a self pollinating, diploid ($2n=2x=20$) with genome (1C=735 Mbp) about 25% the size of Sugarcane. In the world, sorghum is cultivated over 42 million hectares in 98 countries of Africa, Asia, Oceania and the Americas with an average yield of 1238 kg/ha. Nearly 80% of the cultivated area in the world lies in Asia and Africa.

In India, 2.9 million ha land area which includes saline and coastal saline soil is under salinity problems. India has 1.71 million ha saline soil while 1.24 million ha coastal saline soil. Out of the 2.9 million ha, Gujarat occupied 57.93 % i.e. 1.68 million ha soil under salinity problems (2015).

Among the cereals in India, sorghum ranks third, next to rice and wheat. The area under this crop in India is about 5.79 million hectares with an annual production of 5.54 million tones with a productivity of 957 kg/ha. In Gujarat, it occupied an area of about 1.28 lakh hectares with an annual production of 1.75 lakh metric tonnes with a productivity of 1367 kg/ha during 2013-14 (2015).

In India, sorghum ranks third in area and production after rice and wheat. Maharashtra, Karnataka, Andhra Pradesh, Gujarat, Tamilnadu and Madhya Pradesh are the major sorghum growing states. The area under sorghum cultivation in the country has remained more or less unstable in the last two decades. The production has registered a significant increase in the last decades, which is perceptible more during *Kharif* season.

In Gujarat, sorghum is grown as grain crop in South Gujarat, dual purpose in North Gujarat, Kutchh, and Saurashtra and partly as fodder in dairy developed area which occupies on an average about 1.80 lakh hectares. The

productivity is 1338 kg/ha. The sorghum is mainly grown for feed and fodder during *kharif* season while for grain during *rabi* season. The gain in productivity is due to coverage under improved varieties, high yielding varieties and hybrids and due to adoption of economically viable farming technology by the farming community.

The improvement programmed has been under taken intensively with the inception of the university in the state during 1974. The Main Sorghum Research Station, is situated at Surat, falls under zone II, while the testing centre of AICSIP is situated at Deesa. Zone IV. The other testing centres are Viramgam, Dhari, Targhadia, Navsari and Tanchha, which are situated in different agro-climatic zones.

SOUTH GUJARAT

Mainly sorghum is grown for grain purpose and farmers are planting local land races namely; BP 53, SURAT 1 and GJ 108 which are suitable for late or semi-rabi planting. These varieties are late in maturity, poor yielder, susceptible to major pests and diseases with highly photo-thermo sensitive. South Gujarat is known for heavy rainfall area and therefore, the farmers are planting local sorghum by the middle of monsoon to avoid deterioration of grains due to grain mold. Due to poor productivity of local varieties, the return from this crop is very low as compared to other crops. Newly developed varieties, GJ 38 and GJ 42 have a high yielding potentiality, moderately resistance to grain mold and tolerant to water lodging condition so make it suitable under high rainfall area. Hence, farmers now started cultivation of GJ 38 and GJ 42 for commercial cultivation and gradually the area under these high yielding varieties is increasing. In this year new high yielding and grain mold resistant variety Gujarat Navsari Jowar-1 has been released by this centre.

NORTH AND MIDDLE GUJARAT

In North Gujarat sorghum is grown mainly for dual purpose. The rainfall in this area is erratic and very low. The local variety-Malvan is grown by the farmers by middle of monsoon which is poor yielder and highly photo-thermo sensitive, but for the efficient use of water for getting higher production new varieties GJ 39, GFS 5 and CSV 21F have been accepted by the farmers which are not only high yielder but resistance to major pests and diseases and suitable under drought condition. In Kutchh, sorghum is becoming main source of fodder to feed the dairy cattle. The new variety GFS 4, which flowers within 45 days is accepted by the farmers. This variety is producing higher green and dry fodder in unit time and unit area. Variety GFS 5, showed good performance in North Gujarat as well as in Kutchh.

CSV 21F recently identified National variety gives 20% higher green and dry fodder yield and it contains very low HCN.

There is a fast development of dairy industry in middle Gujarat. To meet the fodder requirement, the farmers are planting fodder sorghum variety GFS-5 and CSV 21F. The CSV 21 F also possessed low HCN content, good tillering as well as regeneration capacity suitable for one more cut.

SAURASHTRA

This area comprised of whole Saurashtra including Bhal and Ghed area. The local variety Gundari is normally grown by farmers for fodder and grains in Ghed area. This variety is highly susceptible to leaf spot diseases and poor yielder both in grain as well as fodder. In Ghed area, sorghum is grown after getting the vapsa condition during closing of the monsoon. Similarly, in Bhal area, sorghum is grown as *Rabi* sorghum. The sorghum is planted normally in the month of September-October and the most popular variety is Solapuri. For getting maximum production under residual moisture in Bhal and Ghed area, a suitable variety GJ 38 and GJ 39 have been developed and farmers have accepted these varieties for cultivation. Similarly, GFS 5 and CSV 21F also found suitable for fodder purpose, which is resistance to shoot fly and stem borer and leaf spot diseases.

Growth and evolution of project since inception

- Main Sorghum Research Station is lies under AES II South Gujarat Medium Rainfall Zone, while the testing centre of AICSIP is situated are situated in different agro climatic zones.
- In Gujarat, sorghum is grown as grain crop in South Gujarat, dual purpose in North Gujarat, Kutchh, Saurashtra and partly as fodder in dairy developed area.
- The state has three major seasons viz; the hot weather (March to mid June), Kharif (Mid June to September) and Rabi (October to February).
- During inception of project i.e. 1970-71 the sorghum productivity of Gujarat state was 303 kg/ha in Kharif season, 819 kg/ha in Rabi and 373 kg/ha average for the year.
- Due to development and cultivation of improved varieties and production technologies the productivity is reached to 1446 kg/ha in Kharif, 1259 kg/ha in Rabi and 1367 kg/ha average in year 2014-15.
- Unfortunately the area of grain sorghum was drastically decreased due to scenario of cash crops in Gujarat, but this situation created a huge potential for fodder sorghum.
- Grain yield in sorghum have substantially increased with the use of high yielding, management responsive F₁ hybrids and varieties, but these cultivars

have miserably failed under adverse conditions prevailing in the semi-arid tropics.

- Sorghum crop in semi-arid tropics environment face different biotic and abiotic stress factors at different stages of development.
- Emphasize is given to develop resistance to major diseases and pests and tolerance to major abiotic stress, and ensure that these factors are durable and that yield potential is retained.
- Adoption of recommended practices both under irrigated and rainfed agriculture is another area of importance in sorghum production.
- The scenario of cash crop increased potential for fodder sorghum while due to increasing health consciousness in people the important of quality grain sorghum has bright future in Gujarat state.