Chapter III

Literature on Sorghum

1. Introduction :

Sorghum popularly known as jowar. It is the most important food and fodder crop of dry land agriculture. The annual area under cultivation of sorghum in India ranges between 17-18 million hectars and annual production between 8-10 million tonnes.

Jowar is mainly concentrated in the Peninsular and central India especially in Maharashtra, Karnataka, Andhra Pradesh, Madhya Pradesh, Gujarat, Rajastan, Uttar Pradesh and Tamil Nadu.

Jowar contributes the largest share to the agricultural economy of the Mahrashtra state. In Maharashtra the area under the cultivation of sorghum was 6036.7 hectares during the year 1974-75; and production was 3621.6 tonnes. The average yield of jowar in 1974-75 was 40.70 qu./hectare.

2. Cultivation Practices in Maharashtra :

Sorghum cultivation still remains predominantly traditional in the most part of the country. The preparation of land with ploughs or blade harrows with least application of farmyard manure, line sowing with a seed drill in rows 12- 18" apart and interculturing with bullock drawn implements continue to be practiced; and are very relevant even today.

In Maharashtra jowar is cultivated in rotation with large variety of crops. The nature of preparing tillage varies widely when jowar is cultivated after crops like sugarcane, cotton or

other irrigated crops. Generally the land is ploughed and harrowed in the summer season for kharif (July to November). For rabi season (October to February) the lands are ploughed and harrowed and kept ready for rabi jowar.

A two year rotation of jowar cotton is most common during kharif in the Deccan. During rabi the jowar - cotton, jowar - gram, jowar - jowar rotations are common. Mixed cropping of jowar - tur is most common. Mixtures with mung, urid, cowpea, and other cereals, vegetables etc. during Kharif. During rabi most common practice is observed in Maharashtra.

Harvesting and threshing are still carried out manualy or with bullock power in the most of the districts in Maharashtra. Threshing by running a tractor or with power operated threshery is practiced on a very limited scale. The harvested grain is sundried and stored.

3. Agroclimatic Conditions :

A. Soil types :

Jowar is cultivated in all types of soils i.e. from light soils to very fertile heavy soils. The rabi sorghums are totally confined to black - cotton soils, The kharif sorghums are grown in light soils but on a limited scale. This is the main reason why there is a wide range in the yields of jowar crops in various parts of Maharashtra. Thus the lowest average

yield is 2-3 quintals/hectare in scarcity zones. (Sangli, Solapur districts) to the highest average yield of 18-20 quintals/ hectare in Kolhapur and Satara districts.

B. Seasons :

Sorghum is grown during both Kharif (July - November) and rabi (October - February) seasons. The rabi consisting 36 to 38% of the total acreage. In Deccan it is mainly grown as rabi crop especially in the districts like Solapur, Sangli, Pune, Ahmednagar, Satara, Aurangabad, Nanded, Bhir and Osmanabad.

In the Vidarbh region jowar is mostly grown as kharif crop. The Kharif and rabi seasons correspond with the south-west, north-east mansoon periods. The mansoon is the most important factor in the agroclimatic complex, which is directly related to the production of jowar.

C. Rain fall :

The sorghum belt receives an annual rainfall ranging from 400 to 1000mm. Per annum usually distributed between the last week of June and the first week of October in the most parts of the country.

D. Manures and fertilizers :

The manuring practices also varies in different regions since jowar is almost wholly grown as rainfed crop. Farmers do not use

chemical fertilizers for cultivation of convential varieties. Farmyard manure of about 5 cart loads is used for jowar crop.

In addition to the formyard manure and compost, the application of 30 to 40Kg of N and 30 to 40 Kg of P_2O_5 per hectare in the form of inorganic fertilizers to high yielding varieties would return three times more grain yield than with the locals. In black soils all nitrogen and P_2O_5 can be applied basically. In light textured soils, nitrogen should be given in two doses, one half basal and other half at 30 to40 days after sowing. Nitrogen sources are optimum upto 80 to 90Kg per hectare. This should be applied when fertilizer supplies are not limited.

4. Sorghum in India :

Sorghum is one of the important cereals in India. In acreage it ranks next to rice and in production it occupies third position after rice and wheat. It is one of the major food crop grown under rainfed conditions, in the relatively dry tracts of Central and Southern India and it forms the stable food of the poor classes.

The most important sorghum growing regions in India are Feninsular region, Malva Plateau and Indo-gangetic plains of West Bihar. It is the Deccan plateau that the cultivation of sorghum is concentrated and it is completely dependent on rains. Sorghum is mostly grown as a rainfed crop both in kharif and rabi season.

Maharashtra State contributes to about 34.2% of the total area under the jawar crop in different states in India and 26.4% of the total production of grain in India. Nagpur, Chandrapur, Bhandara, Amaravati, Yeotmal, Buldhana and Dhulia are the important kharif jawar growing districts of Maharashtra State. Rabi jawar is mostly grown in Parabhani, Nanded, Aurangabad, Ahmednagar, Poona, Solapur districts.

5. Improvement and breeding in Sorghum :

Research for improvement of sorghum has increased substantially during the last 15-20 years. The use of commercial hybrid sorghum has increased in many parts of the world during this period.

The high yielding potential of sorghum, its ecological adaptation to harsher climate conditions and its value as a food and feed crop has stimulated considerably the interest in improving the food and feed value to sorghum grain. The genetic principle responsible for the yield jump was the hybrid vigour. Following the development was of hybrid sorghum, the productivity of this crop which had remained stagnant for a very long time, started an upward trend.

An examination of the trend in sorghum production in India did not reveal any marked in the yield, the per hectare averages ranging from 400 to 480Kg. The intensive cultivation of jawar

was never given any serious consideration. The cultivation of tall, long duration varieties over a vast proportion of area, uncertain rainfall conditions and the absence of fertilizer practices have been the major limiting factors in realizing higher yields.

Most of the improved varieties in early period are the result of the pure line selection practiced in principle local varieties. Notable among the varieties developed during this early period are -

1)	Tamil Nadu	- CO series
2)	Andra Pradesh	- Nandyal, Guntur, Anakpulle series.
3)	Karnataka	- Fulgar White, Fulgar Yellow, Kanvi, Bilichigum Nandyal, Hagari, Vanigar.
4)	Gujarat	- Budh, Perio, Sundhia, Chasatio.
5)	Rajastan	- Rs Selections.
6)	Maharashtra	- PJ kharif and rabi selections, NJ 156, NJ 164, PS 13, Saonar, Ramkel, Aispuri, Dagdi, Maldandi 35 - 1, Ganeri - 2.

6. Hybrids in Sorghum :

Male sterility due to interaction of cytoplasm and nuclear factors was demonstated by Stephens and Holland (1954) in the combination of Milo cytoplasm and kharif nuclear factors, which provided a satisfactory tool for production of commercial hybrids. Government of India, recognizing the importance and further potentials of sorghum determined in 1956, to intensity efforts at

improvement, with emphasis on the development and release of hybrids in collaboration with the State Department of Agriculture. Since 1960, several states have established Agricultural Universities and this further helped in breeding programme in sorghum.

There are several hybrids and varieties of sorghum which are now released from various state departments of agriculture and agricultural universities. These released hybrids and varieties are now available for cultivation for farmers in Maharashtra as well as different states in India. Some of the hybrids and varieties of sorghum under cultivation in rabi and kharif seasons can be listed as-

a) Rabi Season - Hybrids-
   1) CSH- 7R
   2) CSH- 8R
   3) CSH-12R

b) Rabi Season - Varieties-
   1) M35- 1
   2) SPV-86
   3) SPV-504
   4) RSV-10R

c) Kharif Season - Hybrids :
   1) CSH- 1
   2) CSH- 2
   3) CSH- 3
   4) CSH- 4
   5) CSH- 5
   6) CSH- 6
   7) CSH- 7
   8) CSH- 8
   9) CSH- 9
   10) CSH-10
   11) CSH-11

d) Kharif Season- Varieties :

1) Swarna	5) SPV- 346
2) No- 302	6) SPV- 351
3) No- 148	7) SPV- 462
4) CS-3541	8) SPV- 669

1) SPV-504 Variety of Sorghum :

SPV means Sorghum Project Variety. Multilocational testing of this variety has been done as RSV-9R in Mahatma Phule Agricultural University juridiction. This entry has been tested on all India multiplication trial as SPV-504; which is released during the year 1985. After release for general cultivation in rabi growing areas of the country, this has been named as Swati in Maharashtra state. This variety is developed from the cross SPV-86 x M 35-1. This SPV-504 variety of sorghum has better performance and superiour characters than other varieties. The average yield (grain) is about 35-40 quintals/ hectares. The fodder is obtained about 80-90 quantals/ hectare. This variety gives 31% and 13% more grain yield than M 35-1 and SPV-86 respectively. The average hight of the plant is about 200 cms; and 1000 grain rate is 28 gms. The duration of maturity is 120-125 days.

2) RSV-10R Variety of Sorghum :

RSV- means Rahuri Sorghum Variety and R represents the rabi season. This variety has been tested in the multilocational trials in the Mahatma Phule Agricultural University juridication as RSV-10R.

This has been tested on all India multilocational trials as SPV-492. This variety is developed from the cross No-148 x R-24. This variety of sorghum is still under testing and yet to be released for cultivation; in Maharashtra as well as in different states of India. The average yield (grain) is about 30-33 quintals/ hectare. The fodder is obtained about 75-80 quintals/ hectare. This variety also shows better characters than its parents. The average hight of the plant is about 190-200 cms. The duration of maturity is 120-125 days.

The voluminous work has been done on the effect of water stress on cereals. In Maharashtra many sorghum hybrids as well as varieties are released which are grown in several places. For our study one of the variety (RSV-10R) which is selected for study is yet to be released and other variety SPV-504 is released in Maharashtra. These are two rabi varieties of sorghum selected for our study, because just to screen these two varieties for drought resistance.

FIG. 3.1 FIELD CROP OF SPV-504 VARIETY OF SORGHUM.

FIG. 3.2 FIELD CROP OF RSV-10R VARIETY OF SORGHUM.

FIG. 3.3 EAR HEAD OF SPV-504 VARIETY OF SORGHUM.

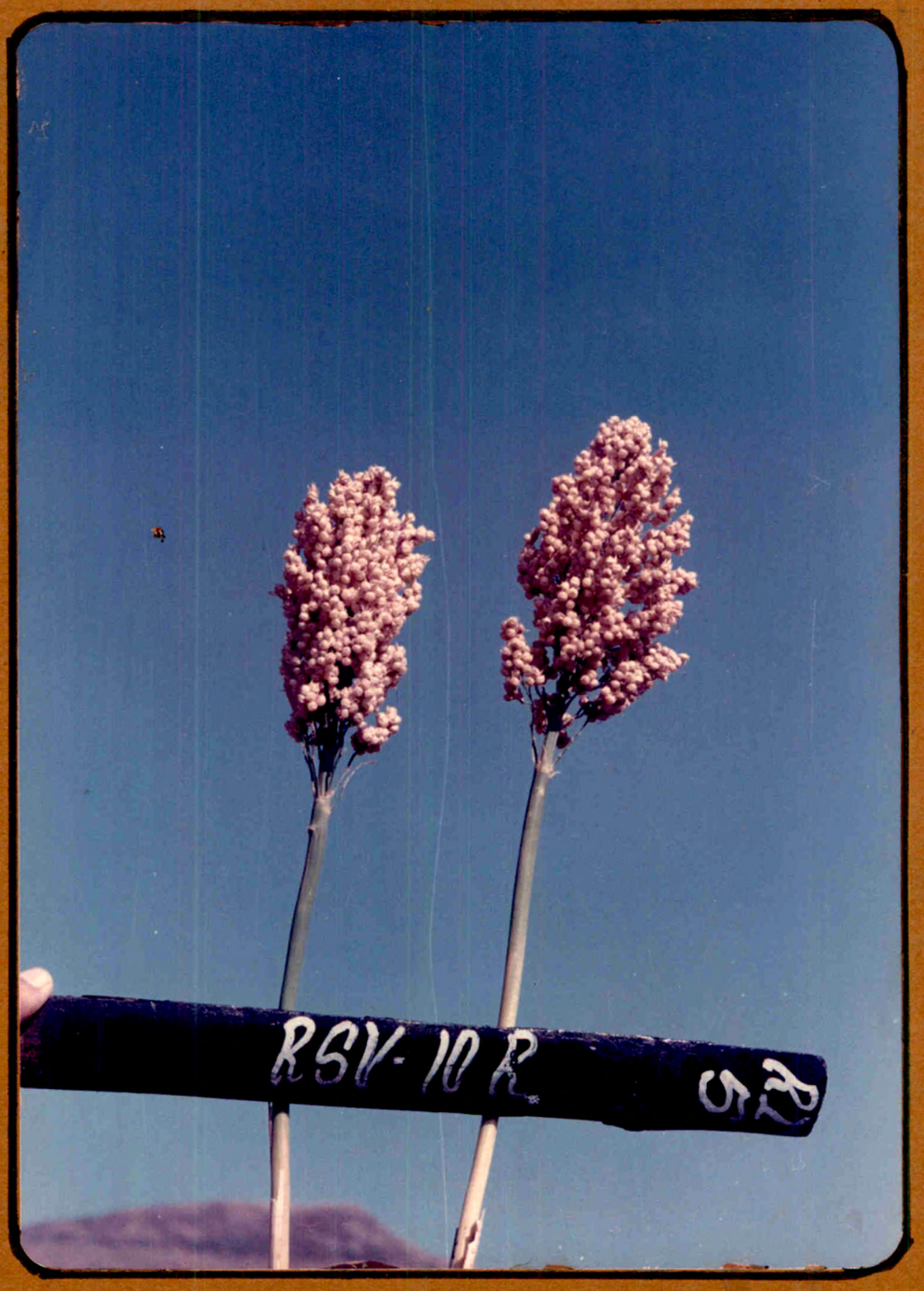

FIG. 3.4 EAR HEAD OF RSV-10R VARIETY OF SORGHUM.