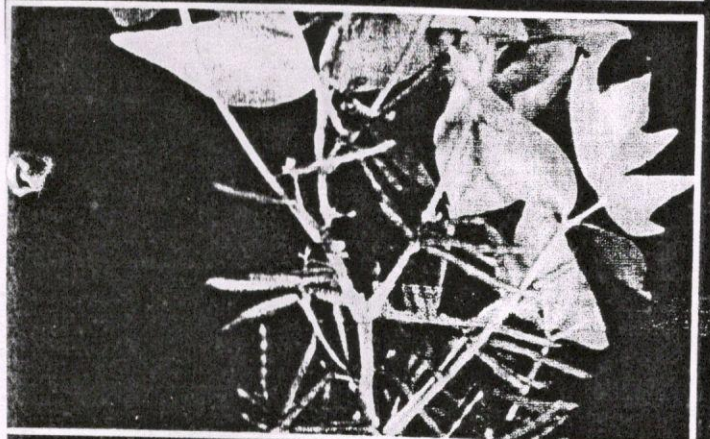


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JOURNAL OF ARID LEGUMES

ISSN: 0973-0907



The present status, potential and constraints in the production of clusterbean (*Cyamopsis tetragonoloba* (L.) Taub) in the Kachchh region of Gujarat

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Abstract

Clusterbean (*Cyamopsis tetragonoloba* (L.) Taub) is the major rain fed crop in Kachchh region, the second largest district of Gujarat state, and is grown in about 62,485 ha with a production and productivity of 23,511 t and 306 kg/ha, respectively. The status of clusterbean in the Kachchh region of Gujarat was analyzed for the last 15 years (1991 to 2005) to find out the constraints and to suggest suitable remedial measures for improving the production. Considering the last 15 years, there was a decrease of 1.2% in the productivity of Clusterbean in Kachchh even though a slight increase in growth rate in area (1.4%) and consequent increase in production (1.17%) was noticed. The productivity showed very high fluctuation (Cv 85%) resulting in even greater vulnerability in production (Cv 101.3%), though the area had moderate variability of 42.3%. The average rain fall during the period was 315.3 mm in 10 rainy days, but with a greater fluctuation of 87 and 58.4%, respectively. These analysis revealed that the area under the crop was almost static (60 to 70 thousand ha) indicating that not much options to replace the crop by the existing remunerative crops in the region. The major constraints for cluster bean production in Kachchh are shallow soil depth, very low content of organic carbon, deficiencies of nutrients like nitrogen, phosphorus and micronutrients like zinc, boron and manganese and, non awareness of the improved varieties and technologies among the farmers. Application of heavy doses of nitrogen in the form of urea is the major cause of nutrient imbalance in the clusterbean growing soils. There is much scope for increasing the production of clusterbean in arid Kachchh by substituting low productive crops like sesame and moth bean with clusterbean, adoption of

integrated nutrient management based on the scientific recommendations, adoption of improved varieties tolerant to drought especially during grain filling stage and providing timely life saving irrigation during the moisture deficit period.

Key words: Clusterbean, Constraints, Production, Rainfed.

Introduction

Kachchh is the largest district (45, 652² km) in the state of Gujarat and the second largest district after Leh in India. The rainfall is scanty, erratic and irregular with annual average of 315.3 mm, distributed in 10 rainy days (average of 1991 to 2005). The cultivated land constitutes only 17.15% of the total district area. The major crops grown in the region are pearl millet, sorghum, pulses like clusterbean, green gram, moth bean and cash crops like groundnut, castor and cotton. The status of clusterbean in the Kachchh region of Gujarat was analyzed for the last 15 years (1991 to 2005) to find out the constraints and to suggest suitable remedial measures for improving the production (Table 1, Fig. 1).

Table 1. The area, production and productivity of clusterbean during 1991 to 2005 in Kachchh region of Gujarat

Year	Rain fall (mm)	Rainy days	Area (ha)	Production (t)	Productivity (kg/ha)
1991-95	329.9	8	77,763.8	36,272.4	462.6
CV (%)	95.8	43.3	26.5	73.2	61.6
5 year annual growth rate	40.36	0.0	11.01	16.1	4.4
1996-2000	247.1	9	75,715.2	17,282.0	224.6
CV (%)	60.8	62.2	30.8	102.2	90.2

5 year annual growth rate	30.58	3.6	4.78	-5.2	-12.89
2001-2005	368.8	11	47976.8	18126.6	230.8
CV (%)	98.2	66.6	70.4	138.4	113.3
5 year annual growth rate	44.32	8.8	-1.6	-2.4	-12.29
1991-2005	315.3	10	62485.3	23511.0	306.0
CV (%)	87.0	58.4	42.3	101.3	85.0
Annual growth rate	9.8	1.21	1.4	1.17	-1.2

A. Production and growth during 1991 to 1995

During the five year period from 1991 to 1995, the average area under cluster bean was 77,763.8 ha with a production of 36,272.4 tonnes. Average productivity was 462.6 kg/ha. The area, production and productivity showed a positive growth rate of 11.01, 16.1 and 4.4%, respectively during this period. A rainfall of 329.9 mm distributed in 8 rainy days was the major factor contributed to positive growth rate in area, production and productivity of the crop in this period. Though the area showed less variability (Cv 26.5%), the productivity of the crop was highly fluctuating (Cv 61.6%) leading to a greater vulnerability in production (Cv 73.2%).

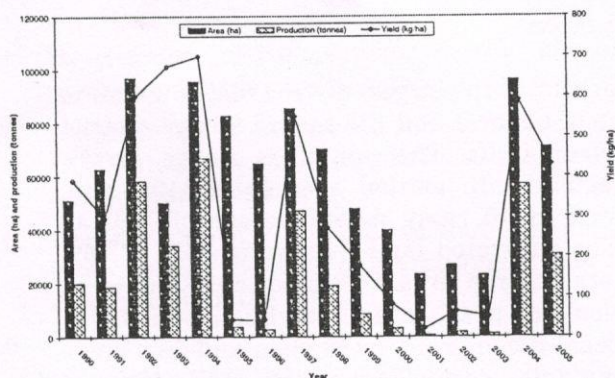


Fig. 1. The area, production and productivity of clusterbean during 1991 to 2005 in Kachchh region of Gujarat

B. Growth during 1996 to 2000

Though the area under cluster bean slightly decreased (2.6%), the productivity declined by more than 50% resulting in production of 17,282 t during 1996 to 2000. The growth rate for the area was positive, the production and productivity showed a negative trend (production -5.2 and productivity -12.9%) in growth and the average productivity was 224.6 kg/ha against 462.6 kg/ha during 1991 to 1995 period. Again, the production and productivity had very high variability of 102.2 and 90.2%, respectively. However, the area showed Cv of 30.8%. The deficient rain fall of 247.1 mm in just 9 days having variability of 60.8%, perhaps was the

main reason behind reduced and highly vulnerable productivity during the period.

C. Growth during 2001 to 2005

The area under the crop further decreased to 47976 ha during this period from 75,715 ha during 1996-2000. However, the productivity remained low (231 kg/ha) with an average production of 18,127 t. The negative trend for production (-2.4%) and productivity (-12.29%) was continued during this period also. Again, the production and productivity showed very high fluctuation with a cv of 138.4 and 113.3%, respectively, though the area had moderate coefficient of variation (70.4%). During the period the average rainfall was 368.8 mm in 11 rainy days. Fluctuation in quantity (Cv 98.2%) and distribution (Cv 66.6%) was very high resulting in lower productivity.

D. Growth during 1991 to 2005

Considering the last 15 years, there was a decrease of 1.2% in the productivity of Clusterbean in Kachchh even though a slight increase in growth rate in area (1.4%) and consequent increase in production (1.17%). The productivity showed very high fluctuation (cv 85%) resulting in even greater vulnerability in production (Cv 101.3%), though the area had moderate variability of 42.3%. Mathur and Henry (2003) analyzed the crop status from 1970 to 1998 and observed that area and production showed negative growth rate where as productivity had positive growth rate. The average rainfall during the period was 315.3 mm in 10 rainy days, but with greater fluctuations of 87 and 58.4%, respectively. These analysis revealed that the area under the crop was almost static (60 to 70 thousand ha) indicating that not much options to replace clusterbean by other remunerative crops in the region. Possibly, the drought hardy nature of the crop capable of producing some yield even in very unfavourable situations is the main factor behind selecting this crop by the farmers.

The major constraints in clusterbean production

In spite of drought hardy nature of the crop that suits to this fragile ecosystem and makes it remunerative option, there are number of constraints hindering improvement in its area and production in the region. The major constraints for cluster bean production in Kachchh are as under:

A. Edaphic constraints. The soils of the region are sandy to sandy loam having shallow depth, with very low water holding capacity. The organic carbon content is very low leading to

deficiencies of nutrients like nitrogen, phosphorus and micronutrients like zinc, boron and manganese. Another constraint is crust formation that hinders seed germination (2).

B. Environmental constraints. The rainfall of the region is very low (315 mm), erratic and skewed. The well distributed rainfall of about 300 mm is sufficient for a normal growth of clusterbean. However, the crop yield was just 50 kg/ha during 2003 when total rainfall received was 993.4 mm in 24 rainy days. The underground water is limited, unevenly distributed and with poor quality beyond prescribed limit for irrigation purpose. The rapid sea water intrusion makes already scarce ground water to a shrinking base further reducing the land suitable for cultivation.

C. Technological Constrains. The profitable and sustainable production and protection technologies suitable to the Kachchh region have been developed and recommended to the farmers for their adoption. However, non-awareness of the improved varieties and technologies among the farmers is the major constraint in realizing higher productivity. Also timely availability of quality seed and inputs in required quantity is often lacking. The application of heavy doses of nitrogen in the form of urea to the crop is the major cause of nutrient imbalance in the clusterbean growing soils.

D. Socio-economical constraints. Clusterbean is grown in marginal soils with very low or no input conditions. The farmers are in tendency to apply more inputs in irrigated cash crops, namely, cotton, groundnut and castor where returns are generally high. Though demand of the crop is increasing due to its industrial use, very often farmers do not get remunerative price thereby losing their interest to apply more inputs and get higher production.

Scope for increasing production in the area

Clusterbean is grown for seed, gum, green fodder and vegetable purposes in the region. Being deep rooted and drought hardy legume, there is much scope for increasing the production of clusterbean in both ways, horizontal spread (by increasing area) and vertical improvement (improving productivity) in arid Kachchh.

A. Horizontal expansion

• **Introduction of crop to new area.** At present only 17.6% of the total area of the region is under agriculture, mainly because of deficient rainfall and lack of irrigation. About 5% of the total area (more than 22,000 ha) is cultivable waste which

can be partially brought under cluster bean cultivation if suitable soil moisture conservation and rain water harvesting technologies are practiced. The chances for bringing new area under cultivation are bright since Narmada Canal water is being brought for irrigation purposes in the region.

- **By substituting low productive crops.** The important rain fed crops in the region that could be substituted are sesame (20000 ha), and moth bean (10000 ha). The productivity of these crops is very low and sometimes is not even remunerative. A rough estimate suggests that if a very moderate substitution of at least 10% is considered, more than 3,000 ha area can be brought under clusterbean cultivation.
- **By intercropping with rain fed crops.** The important rain fed crops namely, pearl millet (55,000 ha), groundnut (44,000 ha), and castor (33,000 ha) are grown in the region. The productivity of these crops is low with a very high variability. The research evidences clearly suggest that intercropping of clusterbean with these crops is more profitable and sustainable than their sole crops (3,4,5). A rough estimate indicates that even at very low adoption rate of intercropping (10%), about 11,000 ha area can be brought under intercropping system.

B. Vertical improvement

The productivity of the crop in the region is very low (306 kg/ha). Application of P and sulphur @40 kg/ha each can enhance grain yield of clusterbean by 39 and 30%, respectively over the control (6). The farmers grow the crop under minimum input conditions and use local cultivar. Looking into the potential of recently released cultivar (2000 kg/ha), there is great scope to further enhance the average productivity under the farmers field if suitable measures mentioned below are adopted.

- Adoption of improved varieties tolerant to drought especially during grain filling stage
- Adoption of integrated nutrient management based on the scientific recommendations,
- Correction of micronutrient deficiency (Zn, B and Mn) based on soil test values
- Adoption of soil moisture conservation and rain water harvesting technology to enhance water availability in the soil
- Providing life saving irrigation timely during the moisture deficit period.

The researchable issues

The improved cultivars recommended for the region under good management conditions have the potential to yield of 1500-2000 kg/ha (7). However, the average yield realized under the farmers field in the region ranged from 200 to 500 kg/ha only. This shows that a large gap is to be bridged between the potential yield and the realized farm yield by adoption of improved agronomic practices by the farmers and developing location specific production and protection technologies which are not only profitable but sustainable too in this fragile ecosystem. The major researchable issues that need to be addressed urgently for enhancing the growth rate of clusterbean production in the region are listed below:

1. Development of short duration cultivars having less than 100 days crop duration to suit the growing period of the region.
2. Development of cultivars tolerant/resistant to abiotic stresses like soil moisture deficit especially at critical growth stages and soil/water salinity and biotic stresses especially for bacterial leaf blight, root rot complexes and powdery mildew.
3. Development of cultivars for specific use like grain, gum, fodder and vegetable purposes.
4. Development of integrated nutrient management strategies to improve quality of the produce and enhance soil health.
5. Development of remunerative and sustainable intercropping systems involving major rain fed crops grown in the region.
6. Development of rain water harvesting and moisture conservation technologies suitable to soil-climatic conditions of the region.
7. Development of eco-friendly integrated pest management modules to suit different levels of pests/diseases infestation.
8. Development of post harvest processing technologies to reduce harvest loss and improve product quality.

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