Sugarcane (*Saccharum officinarum L.*)

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Facts

- **Main source of sugar** in India.
- Prominent position as a **cash crop**.
- Brazil Ranks first in Sugar Production (2015).

Origin

- Cultivation => Vedic Period (1400 – 1000 BC)
- ‘Sugar’ is derived from Sanskrit word “*Sakkara*” or “*Sarkara*”
- Thin Indian Cannes originated in the moist part of north eastern india (similar to Saccharum spontaneum)
- Tropical cannes originated in the larger islands of oceania (New Guinea)

Area and Distribution

Country	Production (thousand metric tons, TMT)
Brazil	739,267
India	341,200
China	*125,536
Thailand	100,096
Pakistan	63,750
Mexico	61,182
Colombia	34,876
Indonesia	*33,700
Philippines	31,874
United States	27,906
World	**1,877,105**

P = official figure, F = FAO estimate, * = Unofficial/Semi-official/mirror data, C = Calculated figure
A = Aggregate (may include official, semi-official or estimates);

Source : Food And Agricultural Organization of United Nations: Economic And Social Department: The Statistical Division

S.No.	State/ UT	Sugarcane (Th. tonnes)
1	Uttar Pradesh	138481
2	Maharashtra	81870
3	Karnataka	41895
4	Tamilnadu	24463
5	Bihar	14131
6	Gujarat	14060
7	Andhra Pradesh+ Telangana	13150
8	Haryana	7650
9	Punjab	7039
10	Uttarakhand	6135

Source: Directorate of Economics and Statistics, Ministry of Agriculture

- In India, **Pricing Policy And Climatic Conditions** play a major role in area and production.

- Uttar Pradesh has the largest acreage :

  - 48% of the area for the crop in whole India

  - 38.6% of the total annual production

Classification

Classification		Description
Kingdom	Plantae	Plants
Sub-kingdom	Tracheobionta	Vascular plants
Super-division	Spermatophyta	Seed plants
Division (Phylum)	Magnoliophyta	Flower bearing plants
Class	Liliopsida	Monocotyledons
Subclass	Commelinidae	–
Order	Poales	–
Family	Poaceae	Grass family
Genus	*Saccharum* L.	–

Species	Other names	Native	Description
S.officinarum	Pondya, Pundia	New Guinea	**Cultivated species. Thick, juicy stalk with high sugar and low fiber. Compressed internodes. Generally resistant to smut, susceptible to mosaic and red rot. Occupies first position in the list of contributors, to the genome (hybrid, complex) of modern cultivated sugarcanes cultivars.**
S.barberi	Includes sugarcane group 'Sunnabile'	North-eastern India	**Cultivated species. Short and thin stalks. Long internodes. Early maturity. Low to Medium sugar content.**
S.sinenes	Includes sugarcane groups 'Nargori, Mungo and Panschi'	North-eastern India	**Cultivated species. Long, thin stalks. Early maturity. Low to Medium sugar content. Prominent nodes. Long and zigzag like internodes.**
S.spontaneum	Kans grass, Kash	South Asia	**Wild species of sugarcane, relative of cultivated cane. Highly resistant to abiotic and biotic stresses. Low sugar content. Occupies second position in the list of contributors, to the genome (hybrid, complex) of modern cultivated sugarcanes cultivars.**
S. robustum		New Guinea	**Swollen, solid internodes**
S.arundinaceumNaanal		South Asia	**Hardy sugarcane species**
S.ravennae	Italian sugarcane, Ravenna grass, Plume	Temperate – tropical Asia	**It is tertiary genetic relative of sugarcane. Can be used as forage and for erosion control.**
S.procerum		–	**Solid internodes.**
S.edule		–	**Partial sterile from cultivated species.**

Climatic Requirements

- Sugarcane is a tropical plant
- It can grow in sub tropical regions also (**North India**)

Warm humid condition => Normal growth, unless terminated by flowering

> 50° C => Growth halt

< 20° C => Slow growth*

*Low temperatures reduces tillering

Optimum Temperature : **26° C - 32° C**

Optimum Rainfall : **75-180 cm/annum**

It requires a long growing season : **10 – 12 months**, need **certain number of heat units** for plant to mature.

Ideal parts of the country are :

- Telangana area of AP
- Maharashtra
- Parts of Karnataka

Under bright sunlight :

- Stems are thicker but shorter
- Leaves are broader and greener

Under low sunshine :

- Stems are slender and long
- Leaves are yellowish and narrower

Soil

It can be grown on all types of soil, ranging from sandy loam to clay loam.

It thrives best on **well drained loamy soils**.

Saline, alkaline and acidic, soils are **not suitable** for this crop

Northern India : Loams and clay loams (Alluviums)

Southern India : Brown/Reddish loams, laterites and black cotton soil

Varieties

S.No.	State	Early ripening	Mid season and late ripening
1.	Uttar Pradesh	CoS 687, CoS 8436, CoS 88230, CoS 95435, CoSe 91232	Co 1148, CoS 767, BO 91
2.	Bihar	BO 90, BO 99, BO 102, BO 120	BO 104, CoS 767, BO 109, BO 89, BO 91, BO 106, BO 108, Co 1148
3.	West Bengal	BO 90	Co 1148, Co 7224
4.	Orissa	Co 7508, Co 7704, Co 62175, Co 740	Co 7219, CoJ 8201, Co 975, Co 7706, Co 8402, Co 62175
5.	Assam	Co 1108	Co 8315, CoJor 1, CoJor 2
6.	Punjab	CoS 8436, Co 89003	CoJ 67, CoJ 83, CoJ 84
7.	Haryana	Co 89003, Co 7717, CoJ 64	Co 1148, CoS 767
8.	Rajasthan	Co 29, Co 997, Co 527, Co 6617	Co 1253, Co 419, Co 1007, CoJ 111, Co 449, Co 527
9.	Madhya Pradesh	Co 527, Co 775, Co 1305, Co 7314, CoC 671	Co 678, Co 1307, Co 6304, Co 419, Co 617, Co 1305, Co 62175, CoLK 8001, Co 7807, Co 8304, Co 7318, CoS 707, Co 1148
10.	Gujarat	Co 775, Co 975, CoC 671, Co 8338	Co 7527, Co 6304, Co 8021, Co 62175, Co 8011, Co 740
11.	Maharashtra	Co 419, Co 775, Co 7219, CoC 671	Co 740, Co 7219, CoM 7125, Co 7527, Co 86032
12.	Karnataka	Co 6415, Co 7704, CoC 671, Co 85002	Co 62175, Co 740, Co 8014, Co 8021, Co 8011, Co 8371, Co 7804, Co 86032
13.	Andhra Pradesh	Co 6907, Co 7805, CoT 8201, Co 8013, Co 8014, CoC 671	Co 62175, CoA 7602, Co 7219, 85 R 186
14.	Tamil Nadu	Coc 671, CoC 8001, Coc 85061, Co 7704, Co 8208, CoC 92061, CoC 90063	Co 6304, CoSi 776, CoSi 86071, Co 8021, Co 85019, Co 86032, Co 86010, Co 86249, CoSi 95071, CoSi 96071, CoSi 98071, CoG 93076

Source: Sugarcane Breeding Institute, Coimbatore (http://www.sugarcane-breeding.tn.nic.in/) & Indian Institute of Sugarcane Research (http://www.iisr.nic.in/)

Cropping System

1. Northern India

1. Maize–potato–sugarcane	2 years
2. Maize–sugarcane–wheat	2 years
3. Rice–sugarcane–wheat	2 years
4. Cotton–sugarcane–ratoon	3 years
5. Sorghum (fodder)–potato–sugarcane–wheat	3 years
6. Rice–chick pea–sugarcane–ratoon–wheat	3 years
7. Rice–toria–sugarcane–ratoon–wheat	3 years
8. Maize–wheat–sugarcane–ratoon–wheat	3 years

2. Southern India

1. Rice–sugarcane–ratoon–wheat	3 years
2. Cotton–sugarcane–ratoon–wheat	3 years
3. Cotton–sugarcane–*Rabi* sorghum	2 years
4. Cotton–sugarcane–chick pea	3 years
5. Sugarcane–ratoon–*Kharif* paddy–winter rice	3 years
6. Rice–groundnut–sorghum–ragi–sugarcane	3 years

Seed and Sowing

1. **Seed Selection**

- Seeds must be free from pests and diseases like red rot, wilt, smut, ratoon stunting etc.
- Top **one third – half portion** of cane has buds of high viability (Best for sowing)
- Should be taken from **well manured, erect and healthy crop** (Age < 10-12 months)
- Bottom portion of cane is **rich in sugar** and takes long time in germination (Jaggery Making)

2. Seed Preparation and Treatment

- Dry leaves are removed by hands (avoiding damage)
- Cane is cut into three budded sets 30- 45 cm long
- 35,000 – 40,000 seeds are needed to plant one hectare
- To prevent the seed setts being attacked by fungal diseases and also to improve germination:

  - 0.5% of Agallol (3%)
  - 0.25% of Aretan (6%)
  - Aretan + Lindane (Northern India)

3. Time of Planting

- 3 times in a year (October, Feb- March and July)
- Requires about 25-32° C for good germination
- Delay causes reduction in yield due to low temperature

- ✓ **March** -> Punjab and Haryana
- ✓ **Feb – March** -> UP
- ✓ **Jan – Feb** -> Bihar
- ✓ **Dec – Feb** -> AP, TN, Maharashtra and Karnataka

Manures and Fertilizers

Fertilizer requirement depends upon :

Soil

- Climate
-

Nitrogen :
120-150 kg/hectare

250-350 kg/hectare

Phosphorous :
80 kg/hectare of P_2O_5

100 kg/hectare of P_2O_5

Potash :

Water Management

Life cycle of the crop (phases) :

1. Germination (0 – 60th day)
2. Formative (60th – 130th day)
3. Grand (130th – 150th day)
4. Maturity (250th – 265th day)

Total Water Requirement : 200-300 cm

Northern:

Avg. 7 irrigations, 5 before and 2 after monsoon

Southern:

8-10 irrigations

Note: In each irrigation, 3 acre inch of water should be applied

Drainage helps in **increasing the yield of cane** as well as **increasing the sucrose content** of the cane.

Weed Control

Autumn Sugarcane

Chenopodium album a.k.a. Bathua

Lathyrus sativa a.k.a. Matri

Vicia spp. a.k.a. Ankari

Angallis arvensis a.k.a. Krishna neel

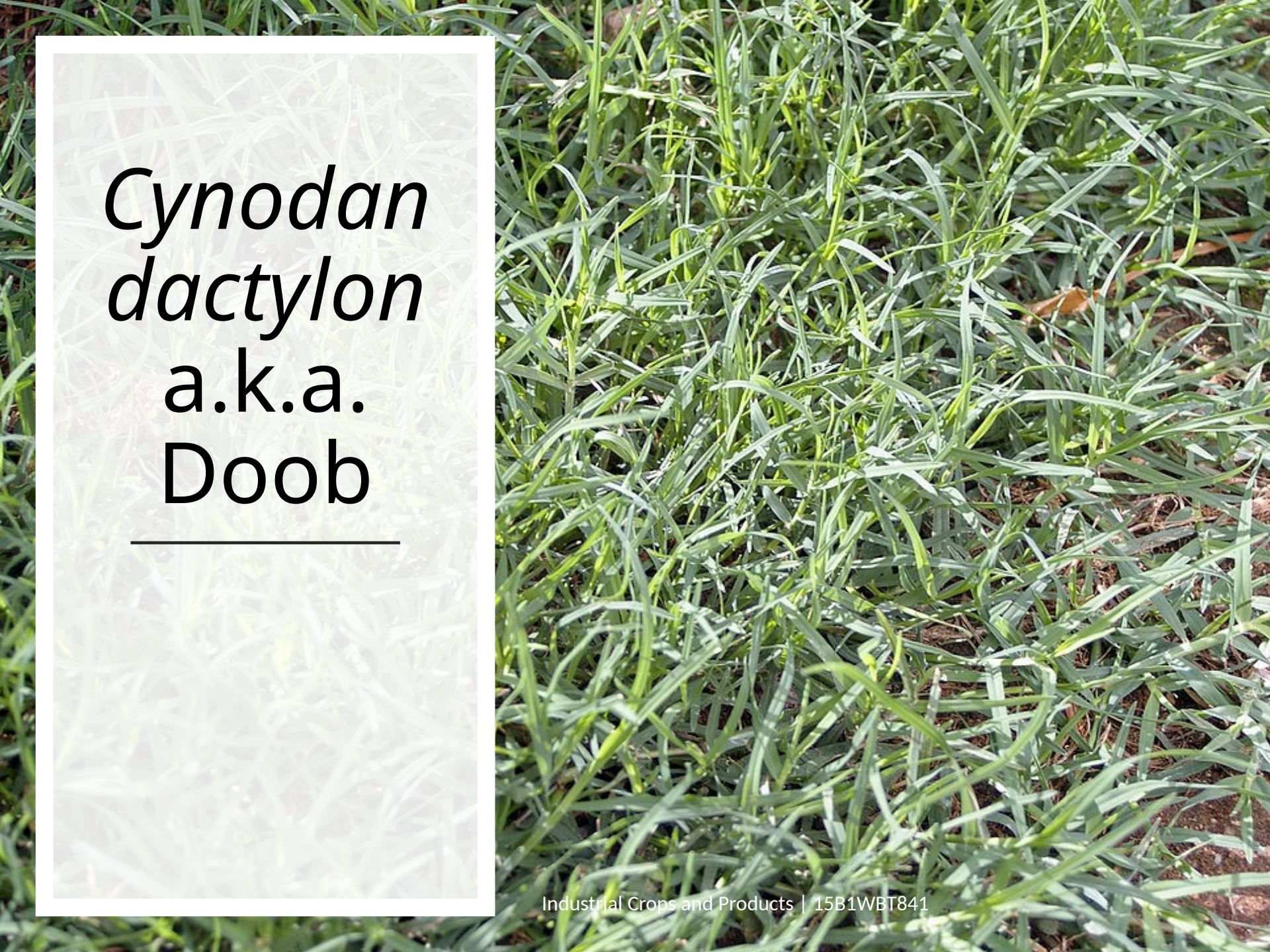
Fumaria parviflora a.k.a. Gajri or Soya

Solanum nigrum a.k.a. Makoya

Spring Sugarcane

Cyperus rotundus a.k.a. Motha

Cynodan dactylon a.k.a. Doob



Sorghum Halepense
a.k.a.
Ban Chari

Rainy Sugarcane

Echinochloa colonum a.k.a. Sama grass

Echinochloa crusgalli a.k.a. Sama grass

Chemical Methods in Weed Control

2, 4-D specifically kills broadleaf weeds in Autumn Cane

Applied 25-30 days after planting or before the weeds attain 3-4 leaf stage

Rate of application : 1 kilograms/hectare in 500-600 liter of water

Atrazine is used for weed control in Spring Cane

Applied just after planting

Rate of application : 2 kilograms/hectare in 500-600 liter of water followed by 1 kilograms/hectare 2, 4-D, after 60 days of planting (MOST EFFECTIVE)

Harvesting

Early December in northern parts of India

But, the content of juice keeps on rising till March end

Maturity Recognition is confirmed by :

- Withering of lower leaves
- Fever green leaves on the top
- Hand Sugar Refractometer : Test the sample from middle portion of stalk

Reading : 17-18 => Ready to Harvest

Yield

Average yield of 11-12 months old planted crop is 400 – 500 quintals/hectare of cane (**Northern India**)

Good crop : 800 – 1000 quintals/hectare

Average yield of 18 months old crop is 1000 – 1200 quintals/hectare (**Southern India** : TN and Maharashtra)

References

Singh, C. (2008). *Modern Techniques of Raising Field Crops*: pp 465 - 489 Oxford & IBH

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Thank You !