

Sugarcane (*Saccharum officinarum* L.):

A) Crop Botany:

It belongs to family Poaceae. It is commonly called kamad or gana. This is the crop that can be propagated vegetatively or through seed.

- i) Root: It has fibrous root system that is about 30 cm deep.
- ii) Stem or stalk: It is about 2 m tall. It is not hollow but filled with cellular tissue for sugar storage. Its lower and central portion is rich in sucrose whereas upper or top portion is mainly glucose. Each bud bears a leaf, at least one dormant bud and a ring of root eyes.
- iii) Leaves: Leaves are large and narrow. The maximum number of leaves per tiller is about 10. Leaf sheath encircles the stem and leaf blade is erect. Leaves on lower nodes die off progressively.
- iv) Seed: mostly sugarcane does not produce seeds but under certain conditions (low temperature and high humidity), seeds are produced which are very small and less viable. Sugarcane seed is called fuzzi. It is mostly propagated through setts (2-3 budded).

B) Agro-meteorology:

- i) Climate: It is a tropical crop but can be grown in arid and semi-arid areas where irrigation is available. For its better germination and growth, temperature range is 20-33°C.
- ii) Soil: Clay loam soil is best. It can tolerate salinity to some extent.

C) Economic Importance:

Pakistan is at 5th position regarding area and production in world. It provides employment to nearly 1 million people. The area of Pakistan under this crop is 1.10 million ha that gives 67.2 million tonnes production. Thus average national yield is 60.9 tonnes per ha (609 mds /A).

Its contribution in GDP is 0.7%, value addition 3.2%. The normal sugar recovery is 9.1%. It is mainly grown for sugar extraction. After juice extraction, the crush-cane residue is called *bagasse* which is used as livestock feed and fuel as well as raw material for paper and hard board. Another by-product of sugar industry is *molasses* that is used for the production of ethanol. The remnants of molasses called press mud or filter cake is used as organic manure.

D) Production Technology:

1) Seed bed preparation: It is a deep rooted crop so land preparation is very important for proper root development. Proper soil tilth is necessary to support germination. Deep ploughing with moldboard plough, sub-soiler or chisel up to depth of 60 cm is necessary in addition to normal seed preparation.

2) Sowing time: There are two growing seasons:

- a) Spring: Mid February – Mid March

b) September sowing: 1st 3 weeks of September (It gives 25% higher yield than spring crop)

3) Varieties:

Early maturing: CP 77-400, HSF-240, HSF-242, CPF-243

Mid Maturing: SPF-213, SPF-234, SPF-246, CPF-247, CPF-248, CPF-249

Late Maturing: COJ-84

HSF-240 and CPF-237 are the best varieties.

3) Seed rate:

a) On weight basis: 100-120 maunds per acre

Healthy setts free from pests. Sett length should be 35-40 cm, 2 eyed setts with two node and one internode

b) On setts basis: 30000-40000 setts per acre

Seed treatment by dipping setts in fungicide solution for 3-5 minutes

c) On area basis: Crop standing on area of 12-16 marlas per acre

Setts should be kept from top portion of stem as these give good germination.

4) Sowing methods: Setts are sown in 2 feet deep furrows by placing them end to end with each other.

a) With respect to soil conditions:

1. Dry sowing: It is better for saline and hard soils. Seed bed preparation is carried out in dry soil condition and field is irrigated immediately after sowing.
2. Wet Sowing: Seed bed preparation and sowing is done in proper *wattar* conditions.

b) With respect to sowing geometries:

1. 60 cm apart single row planting (Conventional method)
2. 90 cm apart double row planting with 30 cm width
3. 120 cm apart triple row planting with 60 cm width
4. Pit plantation of sugarcane.

5) Fertilizer:

Soil type	N	P ₂ O ₅	K ₂ O (kg/acre)
Weak	120	69	50
Fair	92	46	50
Fertile	69	23	25

Whole of P and K at sowing but N in 3 splits as:

a) For autumn sown crop

1/3 N at sowing

1/3 N at the end of February

1/3 N in mid-April

b) For spring crop

1/3 N at sowing

1/3 N in April

1/3 N in end of May

6) Irrigation:

Spring crop = 16 irrigations

Autumn crop = 20-22 irrigations

Irrigation interval 18-20 days

March-April 10-12 days

May-June 13-15 days

July August 15-22 days

November-December 40-50 days

E) Plant protection measures:

i) Weeds: up to 10-35% reduction in yield occurs due to weeds. Weed-crop competition period is 90-120 days

Major weeds are deela, itsit, naru grass, khabbal, Lehli, chulai, hazar dani, jangl palak and parthenium

Control:

1. Physical methods: One blind hoeing before germination and 2-4 subsequent hoeings are necessary.

Last hoeing is done usually at plant height of 1 m after which earthing-up is carried out.

2. Herbicides:

Atrazine @ 1000 ml /acre as pre-emergence

Pendimethalin @ 1500 ml / acre as pre-emergence

Gesapax combi @ 1000 ml / acre as post-emergence at initial growth stage of weeds

ii) Insect-pests: For top borer, stem borer and Gurdaspur borer, Pyrilla (Carbofuran)

For whitefly, (Imidacloprid) and for termites, bifenthrin and chlorpyrifos

iii) Diseases: Red rot, whipe smut, rust, mosaic, red stripe, *Helminthosporium* leaf spot, Pokkah boeng and brown stripe are serious diseases

Losses of up to 10-70% may occur due to diseases

7) Harvesting:

Spring sown in December-February

September sown in October of next year

Ratoon crop of sugarcane:

Ratoon crop kept during end of January – 1st week of March is better than one kept during November-December. Cut the sugarcane 1-1.5 inches below the soil surface. Cultivate between the rows. Do not take ratoon crop from lodged crop. Fill the gaps with same variety. Add 25-30% more fertilizer to ratoon crop as compared to fresh crop.