

WELCOME



CROP DETAILS

- **CROP NAME** : **LINSEED**
- **BOTANICAL NAME** : ***LINUM USITASSIMUM L.***
- **FAMILY** : **LINACEAE**
- **ORIGIN** : **INDIA AND ETHIOPIA**
- **POLLINATION** : **SELF POLLINATION**
- **OIL CONTENT** : **35-45%**

☐ **CLIMATE** – TEMPERATE AND COOL CLIMATE.

☐ **VARIETY** – LSL-93, LSL-08, PADMINI, GS66, DIVYA, ARPITA, K-2, T-397, NO.55, NP (RR) 9, S-4, JAWAHAR-17, JAWAHAR-7 (R-7), M-10, MAYURBHANJ, LC 185, HIRA, MUKTA, NEELUM, B-67, B.S.44

☐ **LAND PREPARATION**

- IT IS OFTEN GROWN ON MARGINAL AND SUB-MARGINAL RAINFED SOILS. TWO TO THREE PLOUGHINGS ARE DONE WITH SUBSEQUENT 2 TO 3 HARROWINGS. SEEDBED SHOULD BE FREE FROM WEEDS AND OTHER DEBRIS. LINSEED REQUIRES FIRM FINE SEEDBED FREE FROM COMPACTION AND PLOUGH PLAN.

❑ SEEDS AND SOWING-

- LINE SOWING IS IDEAL.
- **SPACING** – 30 CM X 10 CM (PLANT POPULATION- 3,33,333)
- **DEPTH** – 2-5 CM
- **SOWING METHOD** – DRILLING
- **SEED-RATE** - 40 KG PER HA
- **SEASON** – RABI

❑ FERTILIZER APPLICATION

- **RDF** – 20-60: 10-30 : 30-60 KG/HA
- **FYM** – 5 T/HA
- SOIL APPLICATION OF 1.0 TO 1.5 KG B AND 20 TO 25 KG $ZNSO_4$ PER HA TO CALCAREOUS SOILS OR RECENTLY LIMED SOIL HAS BEEN SUGGESTED

- **WEED MANAGEMENT**

- WEEDS COULD BE MANAGED BY POST EMERGENCE APPLICATION OF WEEDICIDES ISOPROTURON @ 1.00 KG/HA AT 30-35 DAS. HOWEVER, 2,4-D (NA) @ 0.5KG/HA MAY ALSO BE MIXED IN THE TANK WITH ISOPROTURON IF BROAD LEAF WEEDS ARE ALSO PROBLEM.

- **WATER MANAGEMENT**

- YIELDS CAN BE DOUBLED WITH 1 OR 2 IRRIGATIONS GIVEN AT 35 AND 75 DAS. ON LIGHT SOILS, 3-4 IRRIGATIONS MAY BE NEEDED. BRANCHING, FLOWERING AND GRAIN FILLING ARE CRITICAL STAGES FOR IRRIGATION.

- **HARVESTING AND YIELD**

- CROP SHOULD BE HARVESTED BY SICKLE WHEN THE LEAVES ARE DRY, THE CAPSULES HAVE TURNED BROWN AND SEEDS BECOME SHINY.

- **YIELD**

1. RAINFED CONDITION – 800-1000 KG/HA
2. IRRIGATED CONDITION – 1600-2000 KG/HA
3. PROTECTIVE IRRIGATED CONDITION – 1200-1500 KG/HA

Safflower Production technology

Tillage and Soil

- ✓ One deep ploughing once in three years followed by two to three cross-harrowing or cultivation for breaking of soil-clods will make ideal seed-bed for a good crop of safflower.
- ✓ Soil: Moderate to highly fertile, fairly deep, moisture-retentive and well drained soils .The crop comes equally well in variety of soil e.g. sandy loams, clay loams and alluvial.

Safflower Varieties

Sr.No	Name of Variety	Release Year	Duration Days	Yield qtl/ha	Salient feature
1	PBNS-12	2001	130-135	Irrigated-19 to 20 Rainfed -12 to15	High seed and oil yield Moderately tolerant to aphid and <i>fusarium wilt</i>
2	PBNS-40	2006	118-128	Irrigated-16 Rainfed -10	Non spiny moderately tolerant to wilt, Alternaria leaf spot and aphid
3	PBNS-86 (Purna)	2018	125	Irrigated-20 Rainfed -12	moderately tolerant to wilt, Alternaria leaf spot and aphid
4	PBNS-184	2022	120-123	Rainfed -15	High oil content moderately resistant to wilt, and tolerant to aphid
5	A-1	1978	125-130	12	moderately tolerant to wilt, and aphid
6	Bhima	1983	135-140	14	High oil content

Safflower Varieties

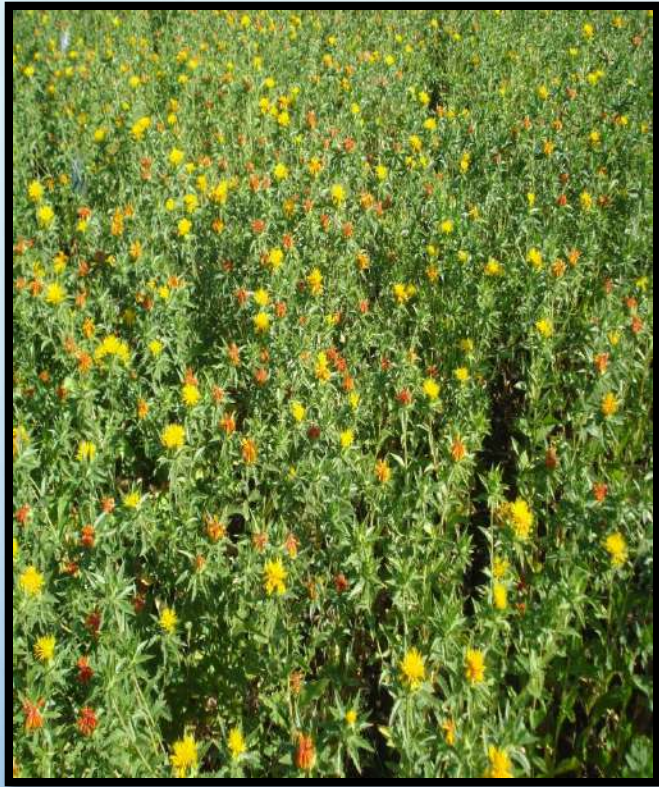
Sr. No.	Name of Variety	Release Year	Duration Days	Yield qtl/ha	Salient feature
7	SSF-12-40	2020	120-125	17	moderately tolerant to aphid
8	SSF-13-71 (Phule Bhivara)	2020	125	16	Tolerant to Alternaria leaf spot
9	SSF-15-65 (Phule Gold)	2021	122	16	Moderately resistant to Fusarium wilt
10	SSF-16-02(Phule Kiran)	2021	132	20	High oil content
11	Raj-Vijay Safflower	2021	127-131	17	High oil content (39.1)
12	NARI-6	1987	120	13-15	Non spiny
13	NARI-H-23	2014	114	17	Tolerent to wilt



PBNS 12



PBNS 184



PBNS 86



PBNS 40



Sharada



PBNS 154

Seed Treatment

✓ Seeds should be treated with Thiram, Captan or Bavistin @ 3 g/kg seeds before sowing to prevent losses from soil borne diseases. Seed Treatment of Trichoderma spp. @ 6gm/kg for seed/soil born diseases and vigour after chemical treatment.

✓ For effective and economic management of the seed/soil bone diseases of safflower like fusarium wilt, macrophonia root and phytophotoraseeding blight and getting higher seed yield, it is recommended to treat the safflower seed before sowing with tricodermaharzianumTh4ds wp @ 10g/kg or Tricodermaharzianum Th4dsc @ 2 ml/kg or carbendazim + mancozeb @2g/kg seed

✓ For effective and economical management of Phytophthora seedling blight, Fusarium wilt and Macrophomina root rot disease, safflower seed bioprimering with TrichodermaharzianumTh4d WP @ 10g/litre water for 12 hrs before.

Sowing Time

- ✓ **Rainfed**- Last week of September to I st week October
- ✓ **Irrigated** – Mid October to Ist week of November

Seed Rate/ sowing method

- ✓ **Seed Rate**: 10-12 Kg/ha, sowing method: A proper seed drill should be used for sowing.
- ✓ **Row to Row distance** : 45 cm and
- ✓ **Plant to plant distance** :20 cm
- ✓ Thinning should be done at **20 DAS**.

Fertilizer Doses and time of fertilizer's application

- ✓ For rainfed conditions apply 40 kg N and 20 kg P per hectare at the time of sowing
- ✓ For Irrigated conditions apply 30 kg N and 40 kg P per hectare at the time of sowing
- ✓ Apply the remaining 30 kg N /ha at 30 to 35 days after sowing

Weed Control

One or two hand weeding and hoeing / harrowing at 25 to 30 and 45 to 50 days after planting depending on the length of rosette period and the severity of weed infection. Pre-emergence application of oxadiazon 1 kg /ha or pre-plant incorporation of flucloralin or trifluralin 1 kg/ha have been found quite effective.

Major disease and pest control

1. Aphids: Spray Dimethoate (0.05%) at 40 and 60 days of sowing.
2. Capsule borer : Spray Dimethoate (0.07%) or Chlorophos @ 500 liters of spray mixture/ha.
3. Alternaria leaf spot: Spray Mancozeb (0.25%) or Propiconazole (0.1%) immediately after disease noticed and repeat the spray 15 days depending upon the intensity of disease.
4. Wilt : Treat the seed with Carbendizium @ 2 to 3g /kg of seed

Irrigation schedule

✓ Give a light pre-sowing irrigation if the soil moisture in the seed zone is not adequate for germination. Later depending upon the soil moisture status, give one irrigation at 35 days after planting in early elongation stage and another at 65 to 70 days during flowering. Sprinkler Irrigation is recommended.

Harvesting

The crop is ready for harvest after 134 to 136 days.

Yield

Rainfed- 10-12 q/ha.

Irrigated – 15-17 q/ha.



SOYBEAN PRODUCTION TECHNOLOGY



Package of practices in Soybean

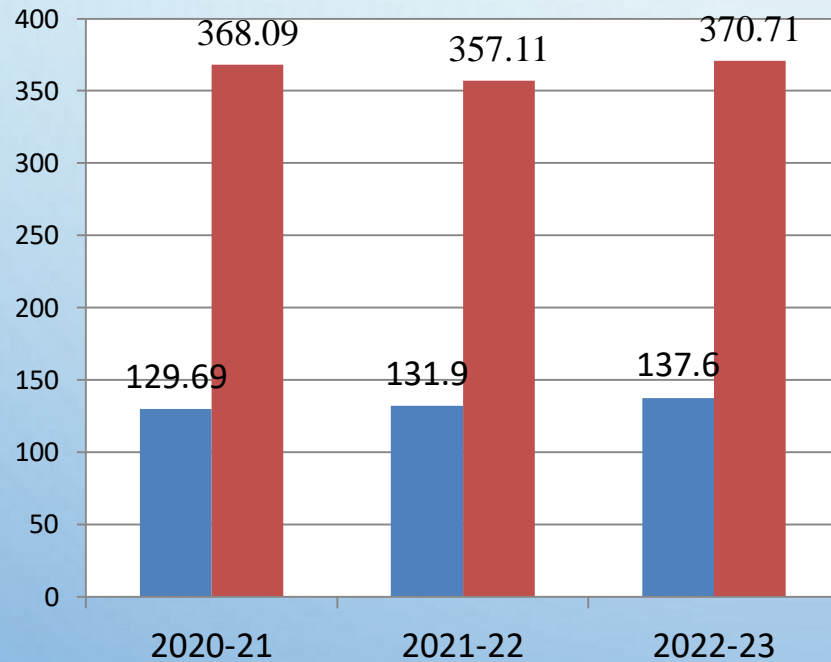
- Introduction
- Soil requirement
- Tillage
- Use of organic manures
- Harrowing
- Sowing techniques
- Selection of varieties
- Central Zone recommended varieties
- Seed germination Test
- Seed rate
- Seed treatment
- Sowing time, Spacing and Sowing depth
- Manures and fertilizers
- Intercropping in soybean
- Weed management
- Water management/Irrigation
- Pest and diseases
- Harvesting and threshing

Soybean-Global Scenario

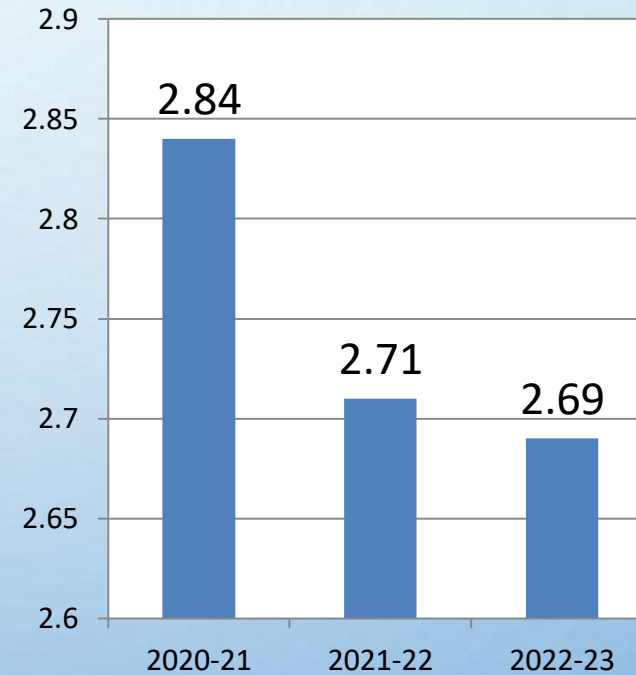
- **Globally Soybean continue to rank first amongst oilseed crops**
- **Contributes to nearly 25% of the world vegetable oil production**
- **Supplies two thirds of protein concentrate for live stock feeding**
- **Important component in formulated feed for poultry and fish**
- **Important commodity for food manufacturers, pharma industry and many more industrial use.**
- **Five major producers, USA, Brazil, Argentina, China and India account for 90% of world production.**
- **India ranks fourth in terms of area under soybean and fifth in terms of production.**

World soybean area, production and productivity (2020-21 to 2022-23)

World soybean area A(mha) & production P (mt)



■ Area ■ Production



Productivity Y(t/ha)

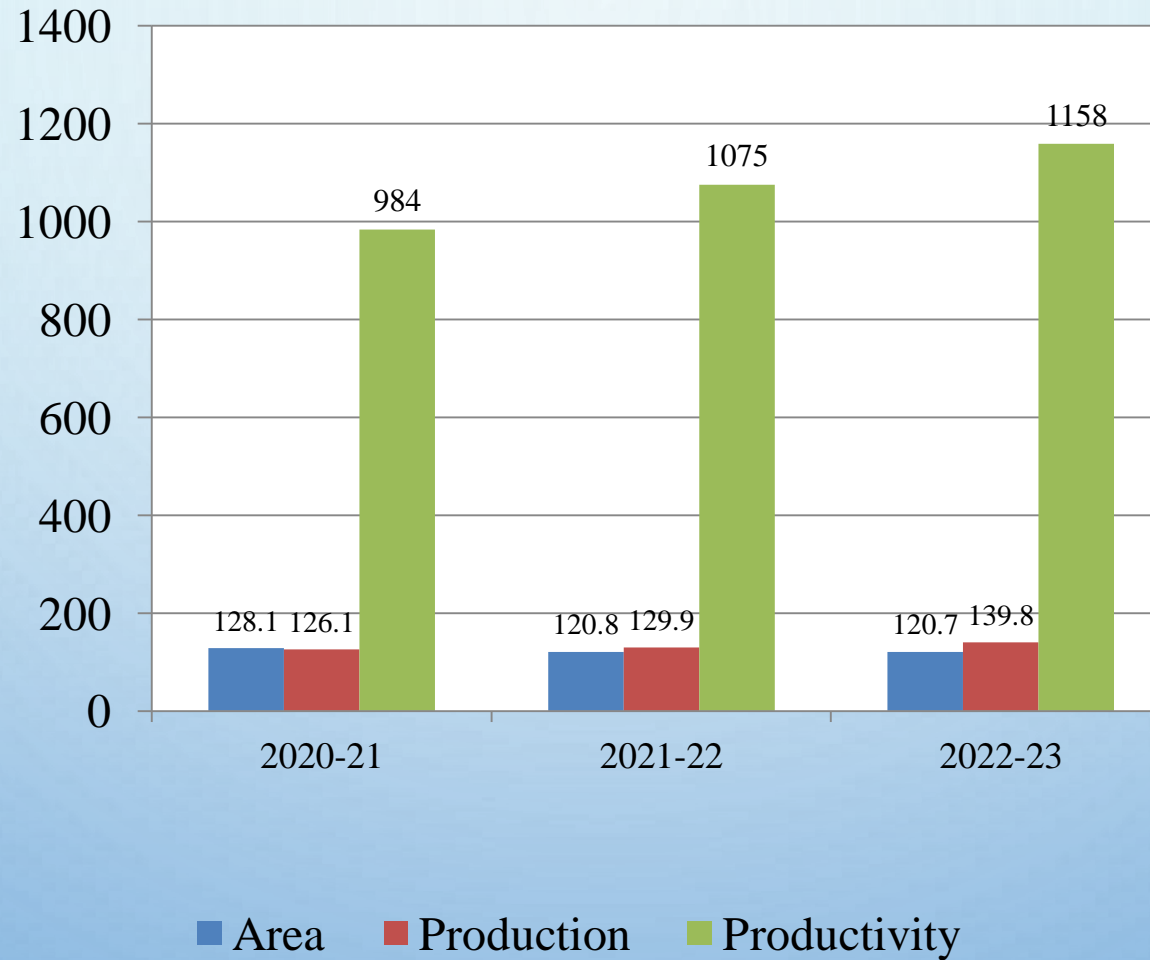
(Source: faostat 2023/AMIS-FAO)

National Scenario

- Soybean is the **leading oilseed** crop of India
- Contributes to **40 % and 25%** of total oilseeds and edible oil produced in the country
- Helps to earn foreign exchange by export of DOC.
- Mainly grown as **rainfed crop** during rainy season in **Vertisols** and associated soils.
- Providing subsistence to **small and marginal farmers** under erratic monsoon conditions
- Improved the **socio-economic status** of the small and marginal farmers in central India
- As a **cheapest source** of high quality protein, has a potential to remove **protein malnutrition**

Soybean in India: Area, Production and Productivity

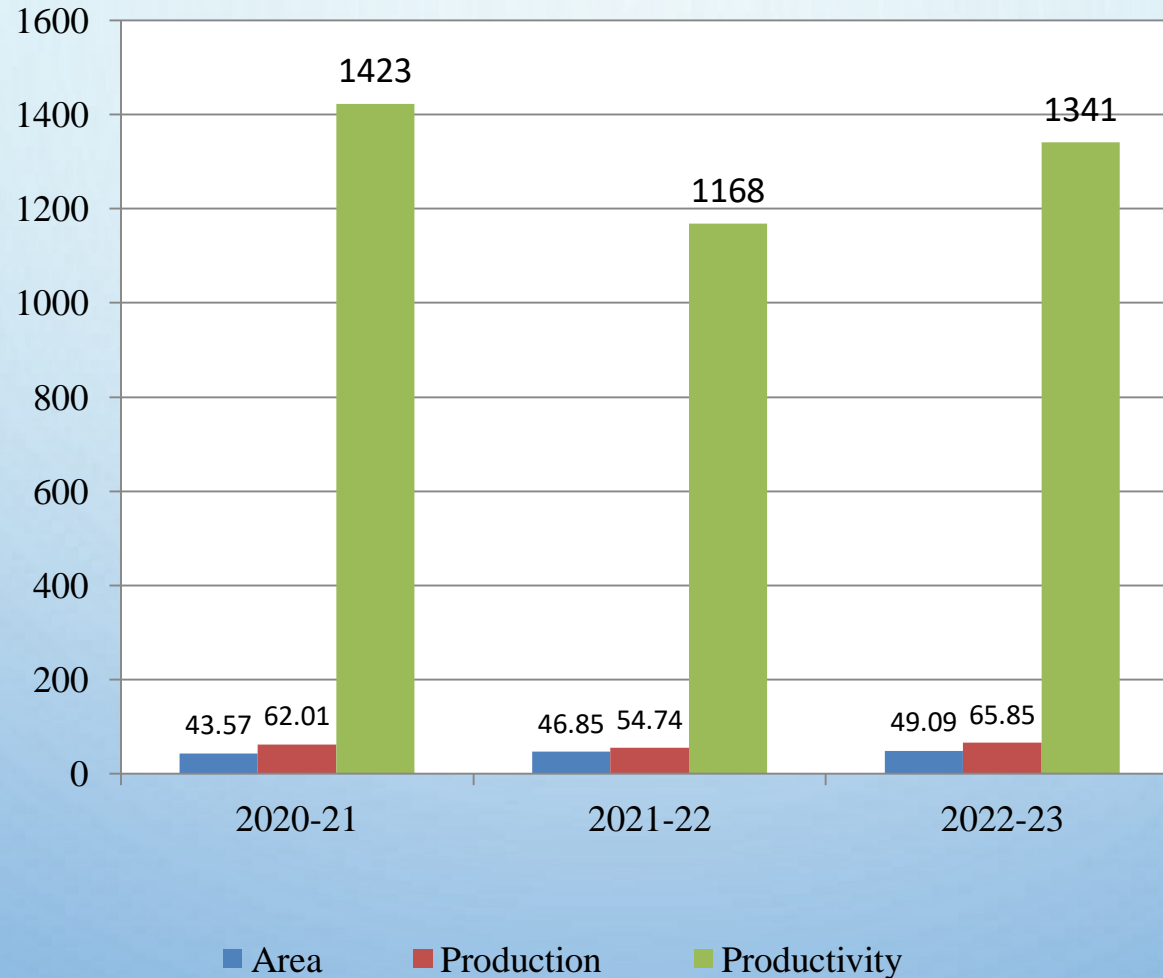
(Area in Lakh ha, Production in Lakh MT, Productivity in kg/ha)



Soybean area A(mha) & production P (lakh mt) and Productivity Y(Kg/ha)

Area, production and productivity of soybean in Maharashtra

(Area in Lakh ha, Production in Lakh MT, Productivity in kg/ha)

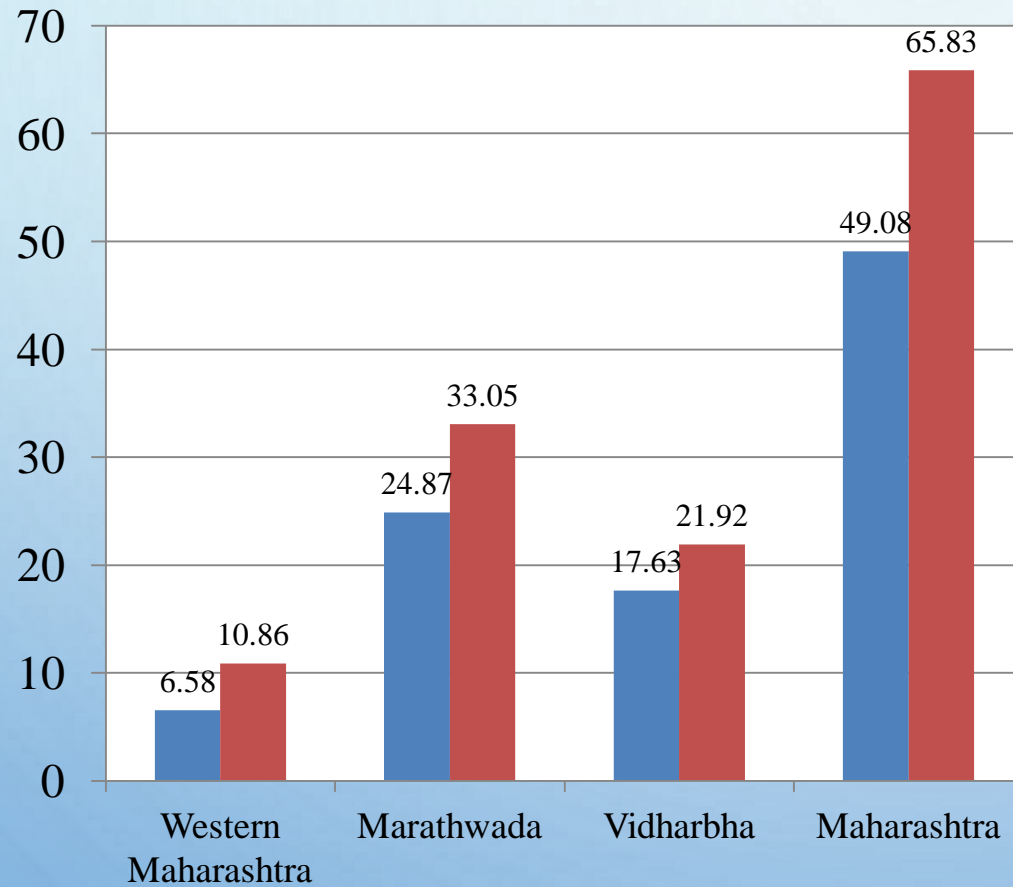


Soybean area A(mha) & production P (lakh mt) and Productivity Y(Kg/ha)

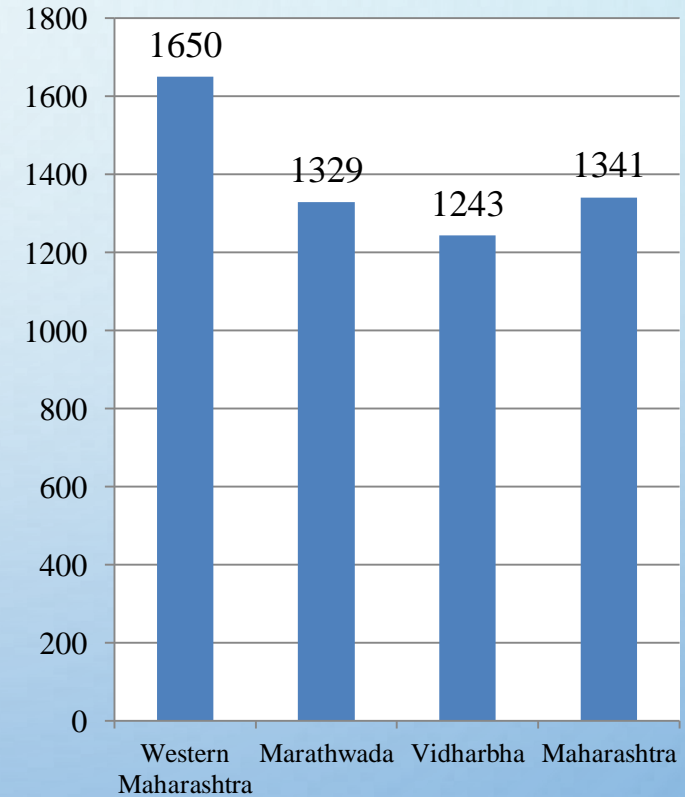
Region wise Area, Production and Productivity of Maharashtra State 2022-23

Region	Area (Lakh ha)	Production (Lakh ton)	Productivity (kg/ha)
Western Maharashtra	6.58	10.86	1650
Marathwada	24.87	33.05	1329
Vidharbha	17.63	21.92	1243
Total Maharashtra	49.08	65.83	1341

Region wise Area, Production and Productivity of Maharashtra State 2022-23



■ Area ■ Production



Productivity

Constraints of Soybean production in India

1. The crop is large grown under rainfed conditions and is highly exposed to vagaries of monsoon like late start of monsoon, long dry spells of 45 to 50 days, heavy rainfall in short span of time, above normal temperatures for long period at the time of flowering and grain development, early withdrawal of monsoon *etc.*, all adversely affecting the seed yield.
2. Many times withdrawal of monsoon rains coincides with harvesting of the crop and there by adversely affecting the seed quality and germination.
3. Pests (*viz.*, Girdle beetle, Stemfly, defoliators *etc.*) and diseases (*viz.*, charcoal rot, collar rot/sclerotial blight, pod blight/anthracnose, purple seed stain *etc.*) causes heavy Yield losses, if unattended.

Constraints of Soybean production in India

4. New emerging biotic problems *viz.*, whitefly and YMV, pea pod borer, rust, *etc.* and Epidemics of pests like *Spodoptera litura*.
5. Due to its thermo sensitive nature soybean is confined only to Kharif season.
6. Little deep sowing (>3-4 cm) leads to poor germination and less plant stand.
7. Little rain touch to soybean seed after maturity causes losses in germination.
8. Soybean seed may loose germination due to improper handling during post harvest process due to its thinner seed coat

Climatic Requirements

- The crop is grown under warm conditions in the tropics, subtropics and temperate climates.
- Soybean is relatively resistant to low and very high temperatures but growth rates decrease above 35°C and below 18°C.
- Soybean grows well in warm and moist climate. A temperature of 26 to 30°C appears to be the optimum for most of the varieties.
- Soil temperatures of 15.5°C or above favor rapid germination and vigorous seedling growth.
- A lower temperature tends to delay the flowering.
- Day length is the key factor in most of the soybean varieties as they are short day plants.
- The optimum soil temperature for germination and early seedling growth is 25 to 30° C
- Photoperiod : Soybean is basically a short-day plant, but response to day length varies with variety and temperature and developed varieties are adapted only to rather narrow latitude differences.

Soil Requirement

- Soybean can be grown in variety of soil types.
- However, a well drained, sandy loam to clayey soils with medium water holding capacity, rich in organic carbon and leveled fields with near neutral pH is ideal for harnessing maximum soybean yield.
- Soil with excessive salts/ sodium, acidic and poorly drained soil are not suitable for soybean.

Tillage

- **Deep summer ploughing**, facilitates exposing the hibernating insects to extreme heat and predatory birds as well as movement of nutrients and infiltration of soil water. Therefore, one deep ploughing once in 3-4 years, otherwise one normal ploughing in summer followed by 2 criss-cross harrowing or cultivation for breaking of soil clods will make ideal seed bed for a good crop of soybean cultivation is recommended.
- Also, **sub-soiling operation** once in 4-5 years at an interval of 10 meter, break the compactness of the subsoil and also facilitate infiltration of rainwater which is useful for uninterrupted crop growth even during drought period also.

Use of organic manures

- In order to have sustainable soybean yield, it is very important to maintain soil health.
- Hence, farmers are advised to incorporate organic manure (well decomposed **FYM @ 5-10 t/ha** or **Compost @ 5 ton/ha** or **Poultry Manure @ 2.5 t/ha**) at the time of land preparation.
- If the quantity of organic manure is limited, they are advised to apply the same on rotation basis in their fields every year. In case of saline soil (pH >7.5), it is also advised to apply **Gypsum @ 150-200 kg/ha** along with FYM/Poultry manure before the last harrowing in case the nutritional requirement is to be planned without sulphur sources for maintenance of soil pH. Similarly, in acidic soil (pH <6.5) it is advised to use **lime @ 600 kg/ha**.

Fertilizers

- Apply **30:60:30:20 NPKS** as recommended fertilizer dose for soybean crop
- i.e. Apply 30 kg N and 60 kg P₂O₅ and 30 kg K₂O and 20 kg of S as Sulphur as basal dressing.
- Soil application of 25 kg ZnSO₄ and 10 kg Borax per hectore.

Sowing techniques

- a. Sole Soybean Sown by Seed Drill:** With increase in mechanization and availability of tractor drawn seed drills, farmers have shifted from bullock drawn sowing equipment like dufan/tifan to use of multi-crop seed drills having adjustable row-to-row distance and seed rate as per the requirement of the crops. Looking to the prevailing climatic aberrations and erratic rainfall, following methods can be used to mitigate the adverse climate.
- b. Broad Bed Furrow planting:** The BBF seed drills have a provision of opening the irrigation channels after an interval of 4-5 rows. The furrow mechanism is fitted on both the ends of BBF seed drills.
- c. Ridges & Furrows planting (FIRB (furrow irrigated raised bed):** Seed drill developed by the institute can be used for sowing each row/paired rows on ridges.
- d. Dibbling:** Now a days dibbling machines are available in the market.

BBF sowing



Selection of Varieties

- In order to avoid risk of yield reduction due to aberrant climatic situation and biotic factors, farmers are recommended to grow 3-4 soybean varieties with varying maturity periods in their fields.
- Different varieties possess resistance/tolerance to particular insect-pest and diseases.
- Long duration soybean varieties are able to give more yields subject to application of irrigation in event of early cessation of monsoon.

Central Zone Recommended Varieties

S.N.	Variety	Year	Maturity duration	Yield (qtl./ha)	Salient features
1	MAUS 71 (Samruddhi)	2002	95-100	30-32	Tolerant to pod shattering up to 12 to 15 days after physiological maturity. Resistant to pests and diseases. 15 % more yield than JS 335.
2	MAUS 158	2009	93-98	26-31	Tolerant to pod shattering up to 12 to 15 days after physiological maturity. Tolerant to stemfly.
3	MAUS 162	2014	100-103	28-30	Tolerant to pod shattering up to 12 to 15 days after physiological maturity. High oil (20.6%) and protein (42.4%). Specially developed for mechanical harvesting.
4	MAUS 612	2018	93-98	32-35	Good pod clustering and high number of pods. Mostly three seeded pods. Moderately resistant to pests and diseases. Tolerant to pod shattering up to 12 to 15 days after physiological maturity
5	MAUS 725	2022	90-95	25-30	Semi determinate, lanceolate and dark green leaves. High number of pods and 20-25% four seeded pods. Moderately resistant to pests and diseases.

S.N.	Variety	Year	Maturity duration	Yield (qtl/ha)	Salient features
6	KDS 726 (Phule Sangam)	2019	100-105	25-30	Resistant to rust disease. Tolerant to stemfly. Resistant to color rot diseases. Recommended for Western Maharashtra
7	KDS 344 (Phule Agrani)	2013	100-105	25-30	Resistant to rust disease.
8	DS 228 (Phule Kalyani)	2005	95-100	23-24	Resistant to rust disease. Recommended for Western Maharashtra
9	JS 335 (Jawahar)	1994	95-98	25-28	Tolerant bacterial pustules. Highest area under cultivation in India
10	JS 93-05	2003	90-95	20-25	Tolerant to insect pest and diseases. 20 to 25% four seeded pods (Maharashtra)
11	JS 95-60	2006	82-88	18-20	Extra early maturity. Tolerant to insect pest and diseases. (Maharashtra)
12	JS 20-34	2014	86-88	20-22	Extra early maturity. Tolerant to insect pest and diseases. Good germination
13	JS 20-29	2014	93-96	25-30	Early maturity. Tolerant to insect pest and diseases. Good germination
14	JS 20-116	2019	97-101	25-30	Tolerant to insect pest and diseases. Good yielding ability. Recommended for Central zone of India
15	JS 20-98	2018	96-101	23	Excellent germinability and longevity. Multiple resistance for biotic stresses like YMV, charcoal rot, blights, bacterial pustules, leaf spots and stem fly. Resistant to tolerant reactions against stem fly, stem borer and defoliators.

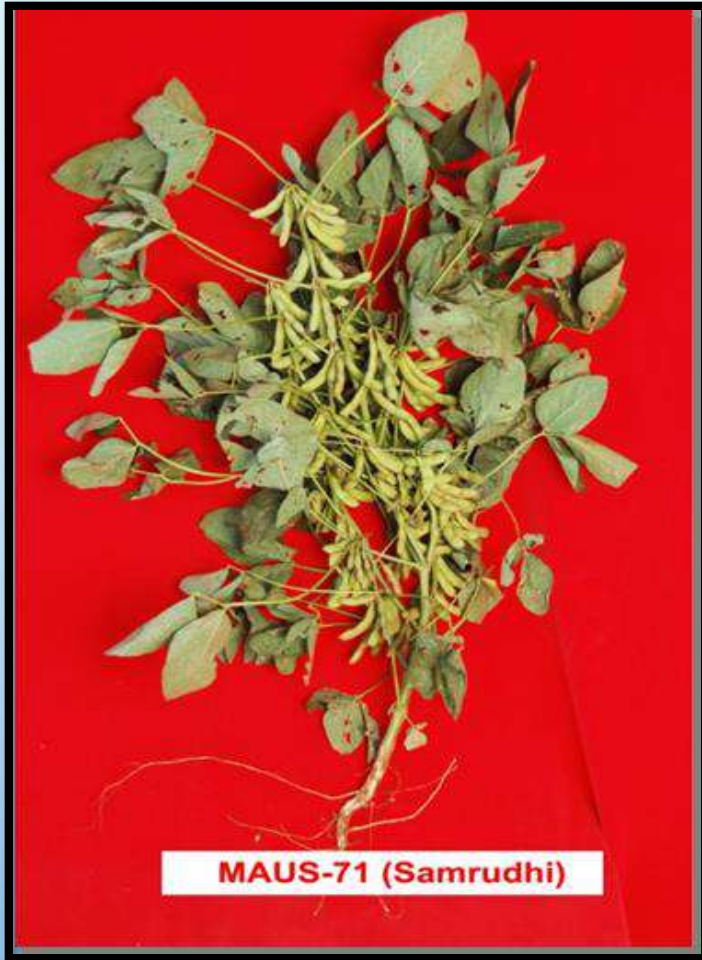
S.N.	Variety	Year	Maturity duration	Yield (Qtl/ha)	Salient features
17	AMS 1001 (PKV Gold)	2018	95-100	22-26	Moderately resistant to Root rot/Collar rot and Yellow mosaic. Moderately resistant to girdle beetle and stemfly.
18	AMS-MB-5-18 (Suvarna Soya)	2019	98-102	24-28	Resistant to Root rot/Collar rot and fungal spots on leaves. Moderately resistant to girdle beetle and stemfly.
19	AMS 100-39 (PDKV Amba)	2021	94-100	28-30	Moderately resistant to Root rot/Collar rot and Yellow mosaic. Moderately resistant to girdle beetle and stemfly. Suitable for summer soybean seed production
20	RVSM 2011-35	2021	98	22	Moderately resistant to PB (ct), YMV and TLS. Susceptible to CR, RAB and MLS, multiple resistant for Stem fly, Girdle beetle and Defoliators.
21	MACS 1520	2021	98-102	22	Resistance to charcoal rot, YMV, bacterial pustule, rhizoctonia aerial blight, alternaria leaf spot and also has high resistance to stem fly, girdle beetle defoliators, leaf hopper, stink bug, bean bugs and pod borer.
22	MACS 1188	2013	95-100	30-35	Suitable for irrigated cultivation (Western Maharashtra)
23	RKS 45	2013	98-100	28	Moderately resistant to bacterial pustules and YMV.
24	RKS 24	2011	95-98	35	Moderately resistant to bacterial pustule, collar rot and YMV as well as girdle beetle, stem fly and defoliators.



MAUS 158



MAUS 162



MAUS 71



MAUS 612



MAUS 725



MAUS 158



MAUS 71



MAUS 162



AMS -MB 5-18



AMS 1001



AMS 100-39



AMS 2014-1



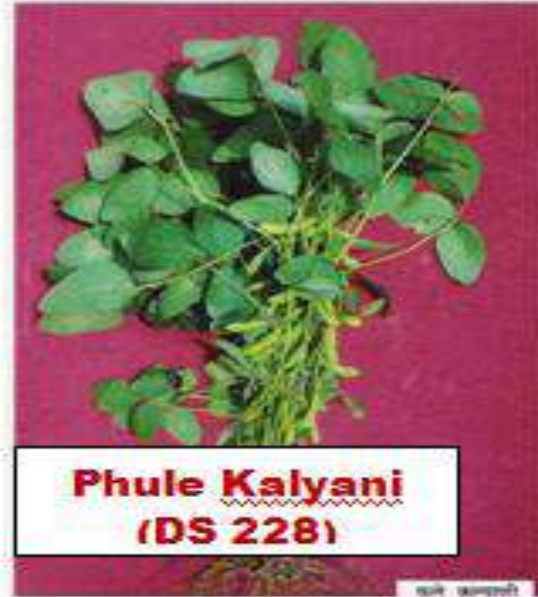
KDS 726



JS 93-05



MACS 1188



**Phule Kalyani
(DS 228)**



JS 335

Seed Germination Test

- Farmers are advised to check germination status of seed purchased/available with them before sowing. To ensure optimum plant population and thereby good yield, minimum 70% germination is essential.
- This can be done through sowing of 100 seeds in 1m X 1m plot and it is kept moist. From 5-8 days emergence is counted everyday till the count is stabilized.
- The germination test can also be done by placing 400 seeds in between two newspaper sheets and rolling them with a moist cloth.
- Farmers are advised to carry out germination of the available seed using 400 seed on random basis and ensure that it has minimum 70% germination.

२) घरगुती पध्दतीने बियाणे उगवणक्षमता तपासणी करण्याच्या पध्दती



१) सर्व बियाण्याचे प्रतिनिधीत्व करतील असे १०० दाणे ओल्या गोण पाटावर रुजविण्यास ठेवावे.



२) सर्व बियाण्याचे प्रतिनिधीत्व करतील असे १०० दाणे ओल्या टिश्यु पेपरवर रुजविण्यास ठेवावे



३) सर्व बियाण्याचे प्रतिनिधीत्व करतील असे १०० दाणे ओल्या न्युज पेपरवर रुजविण्यास ठेवावे



४) सर्व बियाण्याचे प्रतिनिधीत्व करतील असे १०० दाणे ओल्या जर्मेनेटींग पेपरवर रुजविण्यास ठेवावे.



५) सर्व बियाण्याचे प्रतिनिधीत्व करतील असे १०० दाणे सावली खाली मातीच्या ट्रेमध्ये ३ ते ५ से.मी. खोलीवर रुजविण्यास ठेवावे



६) सर्व बियाण्याचे प्रतिनिधीत्व करतील असे १०० दाणे सावली खाली ओल्या मातीमध्ये ३ ते ५ से.मी. खोलीवर रुजविण्यास ठेवावे

Sowing time, Spacing and sowing depth

- **Sowing time:** Sowing should be done after the onset of monsoon during 1st fortnight of June to 1st fortnight of July when 75 to 100 mm rainfall is received.
- **Spacing:** 45 x 5 cm
- **Sowing depth:** 4 - 5 cm

Seed Rate

The seed rate for different sowing methods is as follow

- Sole soybean crop without BBF:** 65 kg/ha (26 kg/acre)
- Broad Bed Furrow (BBF):** 55 kg/ha (22 kg/acre)
- Dibbling:** 35 kg/ha (14 kg/acre)

Seed Treatment

Treat the seed with Carboxin 37.5% + Thiram 37.5% @ 3g/kg seed

or

Trichoderma viridae @ 8-10g/10kg seed

or

Treat the seed with Azoxystrobin 2.5% + Thiophanate Methyl 11.25% + Thiomethoxam 25% FS @ 10 ml/kg seed

After fungicide and insecticide treatment treat the seed with Rhizobium + Posphate solubilizing bacteria (PSB) @ 250 g/10kg seed

or

Rhizophos @ 10ml/kg seed



Intercropping in Soybean

- Intercropping of **Soybean + cotton** (1:1 & 4:2) and **Soybean + Pigeon pea** (2:1 & 4:2) are most popular inter-cropping system under rainfed condition in Maharashtra.

S.N.	Cropping pattern	Intercropping
1.	Soybean-Wheat or Chickpea	Soybean + Pigeon pea
2.	Soybean-Pigeon pea or Safflower or Sorghum	Soybean + Cotton

Intercropping in Soybean



Soybean + Pesionpea



Soybean + Cotton

Water management

- Soybean is grown during Kharif season and due to high rainfall no irrigation is needed.
- However, soybean requires 500 to 625 mm of water in a season for a good crop.
- Since last few years the distribution of rainfall was found to be uneven and erratic.
- The crop should not suffer due to water stress from flowering to maturity.
- Long dry spells (15 to 20 days), particularly during critical growth stages like seedling, flowering and pod filling affect the yield adversely. Hence, farmers are advised to apply life saving irrigation (before the development of soil cracks) during these critical stages in order to sustain yield levels.
- Soybean is very sensitive to excess moisture and the crop is affected, if water stagnates in the fields.

WEED MANAGEMENT

- The crop should be kept weed free by doing two hand weeding or hoeing at 20 and 30 days after sowing.
- If hand weeding/hoeing is not possible then, spray Pre-emergence herbicide Pendimethalin 30% EC @ 2.5 to 3 lit./ha or Diclosulam 84% Wdg @ 12.4 /Acre.
- For Post-emergence herbicide apply Imazythypur 10% SL @ 1.00 lit./ha at 15-20 days after sowing and when weeds are at 2-4 leaf stages.
- Before weedicide spraying confirm the proper moisture present in the soil.

Weeding operation in soybean



Hoeing operation in soybean



Crop protection

- **Pests of Soybean:** Stemfly, Girdle beetle, Semiloopers, Tobacco leaf eating caterpillar, Pod borer (*H.armigera*), whitefly, jassids etc.
- **Diseases of Soybean:** Rust, Collar rot, Charcoal rot, Anthracnose (Pod blight), Soybean yellow mosaic etc.

Apply proper control measures *i.e.* IPM & IDM for the control of insect pests and diseases of soybean to avoid the yield loss.

Spraying of insecticides



Harvesting and Threshing

- Optimum time of harvesting is very important for soybean as it causes yield loss due to shattering and seed viability loss due to field weathering.
- Initiation of change of pod color (physiological maturity) of soybean is the right indication to go for harvesting. At this time, the moisture percentage of soybean seed is around 14-16%. Harvesting can be done when 95% pod changes color from green.
- When the plants reach maturity, the leaves turn yellow and drop and soybean pods dry out quickly. There is a rapid loss of moisture from the seed. At harvest the moisture content of the seeds should be 15 per cent.
- Harvesting can be done by hand, breaking the stalks on the ground level or with sickle. Threshing can be done either with the mechanical soybean thresher or some conventional methods used in other legumes. Threshing should be done carefully and any kind of severe beating or trampling may damage the seed coat and thus reduce the seed quality and viability.
- A moisture content of 13 to 14 per cent is ideal for threshing with thresher. The speed of threshing machine should be maintain between 300to 500 rpm.

Seed yield

By adopting above mentioned improved technology, improved varieties of soybean yield **25-30 quintals** of seed yield per hectare.

Most important points for soybean cultivation

- Application of organic manure (through FYM, Poultry Manure / Vermicompost) in order to maintain the soil fertility. Tailoring the fertilizer dose after soil testing.
- Application of seed rate depending upon the minimum germination percentage of seed (70%) as well as seed size.
- Follow the correct sequence of seed treatment chemicals and bio-inoculants which should be FIR (Fungicide, Insecticide and Rhizobium / PSB / Micorrhiza).
- Do not mix fertilizer with seed while sowing. Instead, use of Ferti-seed-drill is advised.
- As far as possible, sowing may be done during the recommended time (Second week of June to First week of July) while ensuring at least 100 mm monsoon rainfall.
- For weed management in soybean, the most efficient measures include Manual Weeding, Inter-cultivation using Dora/Kulpa and Use of chemical herbicides. The priority for the same may be accorded as per the suitability.

Contd...

- Use of only recommended chemicals are advised for control of weed, insect pests and diseases.
- In order to get the desired results, use of recommended quantity of water (120 litre/ha for power sprayer and 500 litre/ha for knapsack sprayer) while spraying the costly chemicals is advised.
- To avoid shattering losses, harvest the soybean crop after immediately after attaining physiological maturity (turning the pod color to grey/black). The harvested crop should be allowed for sun-drying for 2-3 days after which can be shifted to threshing floor.
- In order to maintain seed purity, uproot the plants of other varieties 2-3 times distinguishing the plant type, leaf shape, pubescence and flower color.
- Store the soybean seed at clean, aerated room on an appropriate platform while avoiding direct contact with moisture.

Safflower Production technology

Tillage and Soil

- ✓ One deep ploughing once in three years followed by two to three cross-harrowing or cultivation for breaking of soil-clods will make ideal seed-bed for a good crop of safflower.
- ✓ Soil: Moderate to highly fertile, fairly deep, moisture-retentive and well drained soils .The crop comes equally well in variety of soil e.g. sandy loams, clay loams and alluvial.

Safflower Varieties

Sr.No	Name of Variety	Release Year	Duration Days	Yield qtl/ha	Salient feature
1	PBNS-12	2001	130-135	Irrigated-19 to 20 Rainfed -12 to15	High seed and oil yield Moderately tolerant to aphid and <i>fusarium wilt</i>
2	PBNS-40	2006	118-128	Irrigated-16 Rainfed -10	Non spiny moderately tolerant to wilt, Alternaria leaf spot and aphid
3	PBNS-86 (Purna)	2018	125	Irrigated-20 Rainfed -12	moderately tolerant to wilt, Alternaria leaf spot and aphid
4	PBNS-184	2022	120-123	Rainfed -15	High oil content moderately resistant to wilt, and tolerant to aphid
5	A-1	1978	125-130	12	moderately tolerant to wilt, and aphid
6	Bhima	1983	135-140	14	High oil content

Safflower Varieties

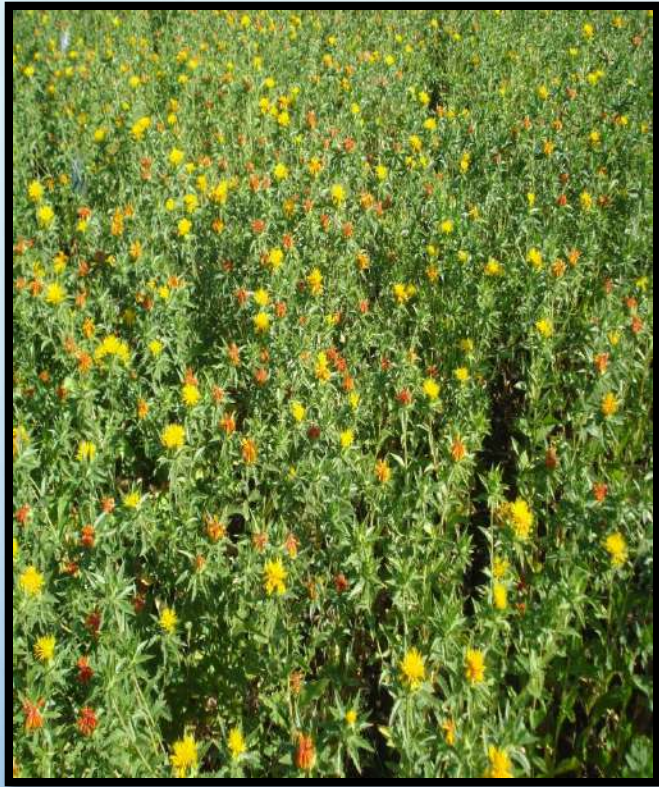
Sr. No.	Name of Variety	Release Year	Duration Days	Yield qtl/ha	Salient feature
7	SSF-12-40	2020	120-125	17	moderately tolerant to aphid
8	SSF-13-71 (Phule Bhivara)	2020	125	16	Tolerant to Alternaria leaf spot
9	SSF-15-65 (Phule Gold)	2021	122	16	Moderately resistant to Fusarium wilt
10	SSF-16-02(Phule Kiran)	2021	132	20	High oil content
11	Raj-Vijay Safflower	2021	127-131	17	High oil content (39.1)
12	NARI-6	1987	120	13-15	Non spiny
13	NARI-H-23	2014	114	17	Tolerent to wilt



PBNS 12



PBNS 184



PBNS 86



PBNS 40



Sharada



PBNS 154

Seed Treatment

- ✓ Seeds should be treated with Thiram, Captan or Bavistin @ 3 g/kg seeds before sowing to prevent losses from soil borne diseases. Seed Treatment of *Trichoderma* spp. @ 6gm/kg for seed/soil born diseases and vigour after chemical treatment.
- ✓ For effective and economic management of the seed/soil bone diseases of safflower like fusarium wilt, macrophonia root and phytophotoraseeding blight and getting higher seed yield, it is recommended to treat the safflower seed before sowing with *tricodermaharzianum*Th4ds wp @ 10g/kg or *Tricodermaharzianum* Th4dsc @ 2 ml/kg or carbendazim + mancozeb @2g/kg seed
- ✓ For effective and economical management of *Phytophthora* seedling blight, *Fusarium* wilt and *Macrophomina* root rot disease, safflower seed biopriming with *Trichodermaharzianum*Th4d WP @ 10g/litre water for 12 hrs before.

Sowing Time

- ✓ **Rainfed**- Last week of September to I st week October
- ✓ **Irrigated** – Mid October to Ist week of November

Seed Rate/ sowing method

- ✓ **Seed Rate**: 10-12 Kg/ha, sowing method: A proper seed drill should be used for sowing.
- ✓ **Row to Row distance** : 45 cm and
- ✓ **Plant to plant distance** :20 cm
- ✓ Thinning should be done at **20 DAS**.

Fertilizer Doses and time of fertilizer's application

- ✓ For rainfed conditions apply 40 kg N and 20 kg P per hectare at the time of sowing
- ✓ For Irrigated conditions apply 30 kg N and 40 kg P per hectare at the time of sowing
- ✓ Apply the remaining 30 kg N /ha at 30 to 35 days after sowing

Weed Control

One or two hand weeding and hoeing / harrowing at 25 to 30 and 45 to 50 days after planting depending on the length of rosette period and the severity of weed infection. Pre-emergence application of oxadiazon 1 kg /ha or pre-plant incorporation of flucloralin or trifluralin 1 kg/ha have been found quite effective.

Major disease and pest control

1. Aphids: Spray Dimethoate (0.05%) at 40 and 60 days of sowing.
2. Capsule borer : Spray Dimethoate (0.07%) or Chlorophos @ 500 liters of spray mixture/ha.
3. Alternaria leaf spot: Spray Mancozeb (0.25%) or Propiconazole (0.1%) immediately after disease noticed and repeat the spray 15 days depending upon the intensity of disease.
4. Wilt : Treat the seed with Carbendizium @ 2 to 3g /kg of seed

Irrigation schedule

✓ Give a light pre-sowing irrigation if the soil moisture in the seed zone is not adequate for germination. Later depending upon the soil moisture status, give one irrigation at 35 days after planting in early elongation stage and another at 65 to 70 days during flowering. Sprinkler Irrigation is recommended.

Harvesting

The crop is ready for harvest after 134 to 136 days.

Yield

Rainfed- 10-12 q/ha.

Irrigated – 15-17 q/ha.

CROP DETAILS

- **Crop Name** : **Sunflower**
- **Botanical name** : ***Helianthus annuus L.***
- **Family** : **Asteraceae**
- **Origin** : **USA & Mexico**
- **Pollination** : **Cross pollination**
- **Oil content** : **35-42%**
- **Protein content** : **14-19%**

➤ **FIELD PREPARATION**

- PLOUGH ONCE WITH TRACTOR OR TWICE WITH IRON-PLOUGH OR THREE TO FOUR TIMES WITH COUNTRY-PLOUGH TILL ALL THE CLODS ARE BROKEN AND A FINE TILTH IS OBTAINED.

➤ **APPLICATION OF FERTILIZERS**

- FYM OR COMPOST - 12.5 T/HA
- RDF FOR KHARIF SEASON – 90:45:45 KG/HA
RABI SEASON - 90:60:40 KG/HA
- **BIOFERTILIZER** : SOIL APPLICATION - MIX 10 PACKETS (2000 G/HA) OF AZOSPIRILLUM AND 10 PACKETS(2000 G/HA) OF PHOSPHOBACTERIA OR 20 PACKETS OF AZOPHOS(4000 G/HA) WITH 25 KG FYM AND 25 KG SOIL AND APPLY BEFORE SOWING
- APPLY SULPHUR @ 20 KG/HA THROUGH AMMONIUM SULPHATE OR SINGLE SUPER PHOSPHATE OR APPLY GYPSUM@ 200KG/HA AS BASAL
- SPRAY BORAX @ 0.2 % (2G/L OF WATER) TO CAPITULUM AT RAY FLORET OPENING STAGE TO IMPROVE SEED SET AND SEED FILLING.

➤ **SOWING**

➤ **SPACING:** HYBRIDS: 60 CM X 30CM (PLANT POPULATION - 55,555)

➤ **SOWING DATE** – 15 JULY TO 1ST WEEK OF AUGUST

➤ **SEED RATE** : 5 KG/HA

• **VARIETY** – PHULE RAVIRAJ , PHULE BHASKAR, SURYA, MORDEN

• **HYBRIDS** – LSFH-171, LSFH-35(MARUTI), RSFH-1 (TUNGA), KBSH-53, LSFH-1

➤ **SEED TREATMENT**

• SOAKING SEEDS IN 2% ZNSO₄ FOR 12 HRS AND SHADE DRYING IS RECOMMENDED FOR RAINFED SOWING.

• TREAT THE SEED WITH *TRICHODERMA* @4G/KG. THIS CAN BE DONE JUST BEFORE SOWING. IT IS COMPATIBLE WITH BIOFERTILIZERS. SUCH SEEDS SHOULD NOT BE TREATED WITH FUNGICIDES.

➤ **WEED MANAGEMENT**

- APPLY FLUCLORALIN AT 2.0 L/HA BEFORE SOWING AND INCORPORATE OR APPLY AS PRE-EMERGENCE SPRAY ON 5 DAY AFTER SOWING FOLLOWED BY IRRIGATION OR APPLY PENDIMETHALIN AS PRE-EMERGENCE SPRAY 3 DAYS AFTER SOWING. THE SPRAY OF THESE HERBICIDES HAS TO BE ACCOMPLISHED WITH BACK PACK/KNAPSACK

➤ **WATER MANAGEMENT**

- IN KHARIF SEASON IF THERE IS SUFFICIENT RAIN NO IRRIGATION ARE REQUIRED
- IRRIGATE IMMEDIATELY AFTER SOWING FOLLOWED BY AN IRRIGATION ON 4 - 5TH DAY AND LATER AT INTERVALS OF 7 TO 8 DAYS ACCORDING TO SOIL AND CLIMATIC CONDITIONS,

➤ **HARVESTING**

- I. CUT THE CAPITULA (FLOWER HEADS) ONLY
 - II. THRESH AND CLEAN
 - A. IMMEDIATELY AFTER HARVEST, DRY THE HEADS IN THE SUN FOR 3 DAYS.
 - B. SPREAD THE HEADS IN THIN LAYER AND GIVE TURNING ONCE IN 3 HOURS
 - C. THRESH USING A MECHANICAL THRESHER, OR BEAT WITH A STICK AND SEPARATE THE GRAINS.
 - D. WINNOW AND CLEAN THE SEEDS
 - E. DRY THE SEEDS AGAIN IN THE SUN FOR ANOTHER TWO DAYS
 - F. STORE IN GUNNY BAGS
- **YIELD** - 1800-2000 KG/HA

CROP DETAILS

- **CROP NAME** : **LINSEED**
- **BOTANICAL NAME** : ***LINUM USITASSIMUM* L.**
- **FAMILY** : **LINACEAE**
- **ORIGIN** : **INDIA AND ETHIOPIA**
- **POLLINATION** : **SELF POLLINATION**
- **OIL CONTENT** : **35-45%**

☐ **CLIMATE** – TEMPERATE AND COOL CLIMATE.

☐ **VARIETY** – LSL-93, LSL-08, PADMINI, GS66, DIVYA, ARPITA, K-2, T-397, NO.55, NP (RR) 9, S-4, JAWAHAR-17, JAWAHAR-7 (R-7), M-10, MAYURBHANJ, LC 185, HIRA, MUKTA, NEELUM, B-67, B.S.44

☐ **LAND PREPARATION**

- IT IS OFTEN GROWN ON MARGINAL AND SUB-MARGINAL RAINFED SOILS. TWO TO THREE PLOUGHINGS ARE DONE WITH SUBSEQUENT 2 TO 3 HARROWINGS. SEEDBED SHOULD BE FREE FROM WEEDS AND OTHER DEBRIS. LINSEED REQUIRES FIRM FINE SEEDBED FREE FROM COMPACTION AND PLOUGH PLAN.

❑ SEEDS AND SOWING-

- LINE SOWING IS IDEAL.
- **SPACING** – 30 CM X 10 CM (PLANT POPULATION- 3,33,333)
- **DEPTH** – 2-5 CM
- **SOWING METHOD** – DRILLING
- **SEED-RATE** - 40 KG PER HA
- **SEASON** – RABI

❑ FERTILIZER APPLICATION

- **RDF** – 20-60: 10-30 : 30-60 KG/HA
- **FYM** – 5 T/HA
- SOIL APPLICATION OF 1.0 TO 1.5 KG B AND 20 TO 25 KG ZNSO_4 PER HA TO CALCAREOUS SOILS OR RECENTLY LIMED SOIL HAS BEEN SUGGESTED

- **WEED MANAGEMENT**

- WEEDS COULD BE MANAGED BY POST EMERGENCE APPLICATION OF WEEDICIDES ISOPROTURON @ 1.00 KG/HA AT 30-35 DAS. HOWEVER, 2,4-D (NA) @ 0.5KG/HA MAY ALSO BE MIXED IN THE TANK WITH ISOPROTURON IF BROAD LEAF WEEDS ARE ALSO PROBLEM.

- **WATER MANAGEMENT**

- YIELDS CAN BE DOUBLED WITH 1 OR 2 IRRIGATIONS GIVEN AT 35 AND 75 DAS. ON LIGHT SOILS, 3-4 IRRIGATIONS MAY BE NEEDED. BRANCHING, FLOWERING AND GRAIN FILLING ARE CRITICAL STAGES FOR IRRIGATION.

- **HARVESTING AND YIELD**

- CROP SHOULD BE HARVESTED BY SICKLE WHEN THE LEAVES ARE DRY, THE CAPSULES HAVE TURNED BROWN AND SEEDS BECOME SHINY.

- **YIELD**

1. RAINFED CONDITION – 800-1000 KG/HA
2. IRRIGATED CONDITION – 1600-2000 KG/HA
3. PROTECTIVE IRRIGATED CONDITION – 1200-1500 KG/HA

A pair of hands is shown from a top-down perspective, cupped together and holding a large quantity of yellow soybean seeds. The hands are positioned in the center of the frame, with the seeds filling the palms. The background is a vast field of green soybean plants, with rows of plants stretching into the distance. The lighting is bright, suggesting a sunny day. The overall scene conveys a sense of agricultural productivity and the care of the harvest.

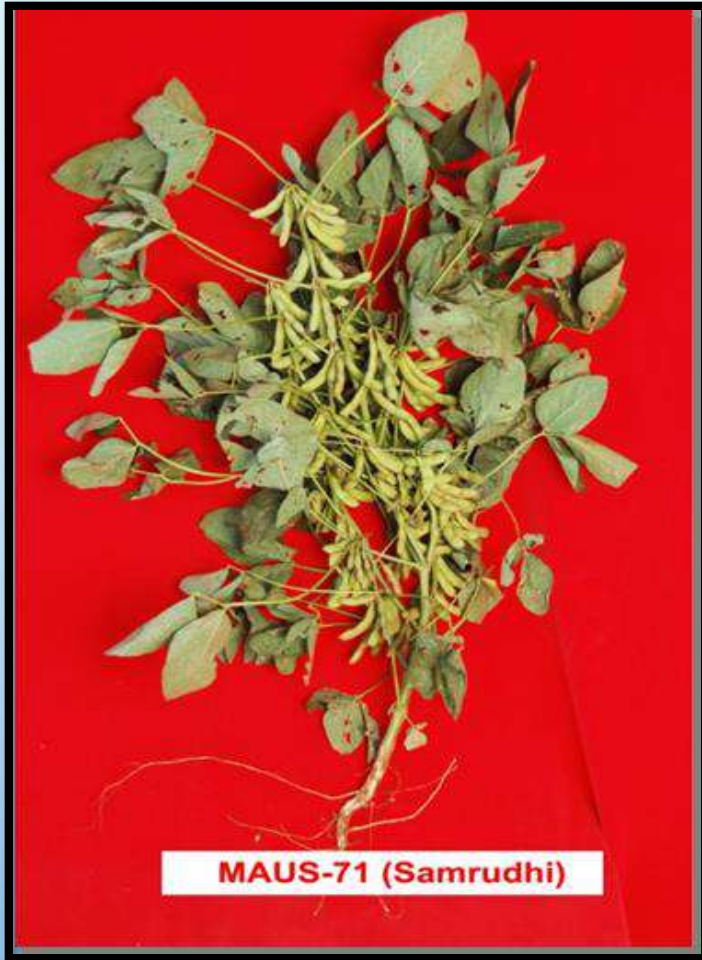
Thank you



MAUS 158



MAUS 162



MAUS 71



MAUS 612



MAUS 725



MAUS 158



MAUS 71



MAUS 162



AMS -MB 5-18



AMS 1001



AMS 100-39



AMS 2014-1



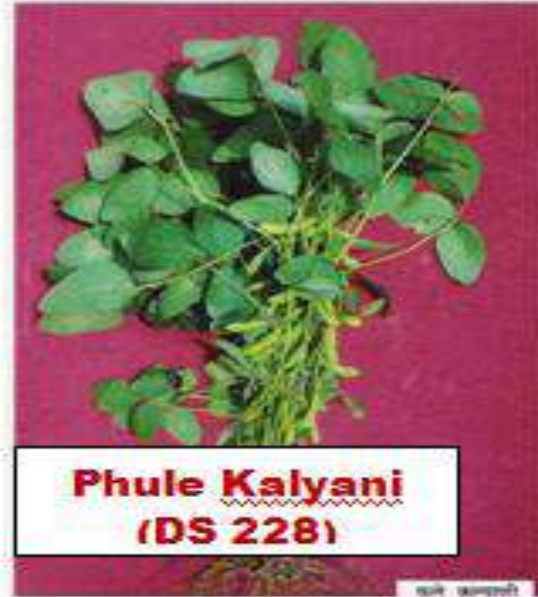
KDS 726



JS 93-05



MACS 1188



**Phule Kalyani
(DS 228)**



JS 335

WELCOME



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• TREAT THE SEEDS WITH CARBENDAZIM OR THIRAM AT 2 G/KG OF SEED.

• TREAT THE SEEDS 24 HOURS PRIOR TO SOWING.

➤ **WEED MANAGEMENT**

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➤

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