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Package of Practices for Crops of Punjab **KHARIF 2023**



**PUNJAB AGRICULTURAL UNIVERSITY
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b) Bio-fertilizer: Treat the nursery roots with one packet of recommended bio-fertilizer before transplanting.

c) Chemical Fertilizers: Apply fertilizer on soil test basis (See Chapter on 'Soil Testing'). However, in the absence of soil test, apply the fertilizers as under:

*Nutrients (kg per acre)			Fertilizers (kg per acre)			
N	P ₂ O ₅	K ₂ O	Neem coated urea	DAP	or single superphosphate	Muriate of potash
42	12	12	90	27	75	20

* These nutrients can also be supplied from the other fertilizers available in the market (Appendix VII)

To reduce sterility in paddy, apply foliar spray of 1.5% potassium nitrate (3 kg potassium nitrate in 200 litre of water per acre) at boot stage.

Note:

- Skip phosphorus application to rice if recommended dose of phosphorus had been applied to the preceding wheat crop.
- Apply phosphorus and potassium fertilizers only when the soil test shows deficiency of these nutrients (See Chapter on Soil Testing).
- Apply the whole of phosphorus and potassium as per soil test before the puddling. Phosphorus can be top dressed up to 21 days after transplanting.
- When 27 kg DAP is used in deficient soil, reduce the urea dose by 10 kg.
- Apply nitrogen fertilizer in 3 equal splits to all recommended varieties. The first split should be applied upto 7 days of transplanting and second split at 21 days of transplanting. The third split to short duration (PR 126) should be applied at 35 days of transplanting while for other varieties, it should be applied at 42 days of transplanting.
- Apply the second and the third split of nitrogen when water is not standing in the field. Irrigate on the third day of the application of fertilizer.

PAU-Leaf Colour Chart (PAU-LCC) for need based Urea application

- Apply basal dose of 25 kg urea per acre.
- Start matching colour of the first fully exposed leaf from the top with the LCC at 7 day intervals after 14 days of transplanting.
- Whenever the greenness of 6 or more out of 10 leaves is lighter than LCC shade 4 apply 25 kg urea per acre.
- No urea should be applied if colour of leaves is equal to or darker than LCC shade 4.
- Use of LCC should be discontinued after initiation of flowering and no more urea should be applied.

Note: Need based nitrogen management using LCC holds good for all the prevalent rice varieties grown in all type of soils. The use of LCC is highly beneficial for optimum fertilizer nitrogen use when fields are

- Prefer to use organic/green manures and reduce dose of chemical fertilizer accordingly.
- Skip phosphorus application if recommended dose of phosphorus had been applied to the preceding wheat crop.
- Use PAU-Leaf Colour Chart for need based nitrogen application.
- Excessive use of nitrogenous fertilizers particularly during flowering causes sterility and consequently heavy reduction in yield.
- To manage iron deficiency apply foliar sprays of 1% ferrous sulphate solution.

Varieties	Time of Nursery Sowing	Time of Transplanting
Punjab Basmati 7 and 5, Pusa Basmati 1121, 1637 and 1718	First fortnight of June	First fortnight of July
CSR 30 and Pusa Basmati 1509	Second fortnight of June	Second fortnight of July

Age of Seedlings: Seedlings of Basmati varieties are ready for transplanting when they attain 5 to 6 leaf stage or are 25-30 days old. Longer stay of seedlings in the nursery bed results into node formation which reduce tillering and yield in basmati varieties. About 25 days old seedlings of Pusa Basmati 1509 should be transplanted for better tillering.

Method of Transplanting: Irrigate the nursery before uprooting and wash them to remove mud. Transplant two seedlings per hill in lines at 20 x 15 cm (33 hills/sq. metre) during the optimum period in a well puddled field. In the late transplanted crop, the spacing may be reduced to 15x15 cm (44 hills/sq. metre) to minimize the reduction in yield.

Fertilizer Application

Use organic and chemical fertilizers as under:

a) Organic Manures: Practice green manure before basmati. Do not apply urea if the field has been green manured with 45-55 days old sunnhemp/dhaincha or summer moong straw has been incorporated after picking of pods.

b) Chemical Fertilizers: Apply fertilizers on soil test and crop rotation basis. Skip phosphorus application if the recommended dose of phosphorus has been applied to the preceding wheat crop. However in phosphorus deficient soils, apply 75 kg of superphosphate per acre before last puddling. Recommended dose of urea for different varieties is as under:

- CSR 30 - 18 kg urea per acre
- Punjab Basmati 7 & 5 and Pusa Basmati 1121, 1637 & 1718 - 36 kg urea per acre
- Pusa Basmati 1509 - 54 kg urea per acre

High doses of nitrogen application to basmati causes excessive vegetative growth and plant height. This makes the crop more prone to lodging thus resulting into poor yield. Apply urea in two equal splits at 3 weeks and 6 weeks after transplanting. If possible, apply urea when water is not standing in the field. Irrigate on third day of the application of urea.

PAU-Leaf Colour Chart (PAU-LCC) for need based Urea application

- No basal urea should be applied at the time of transplanting of basmati rice.
- Start matching colour of first fully exposed leaf from top of plant with the PAU-LCC at 7 days interval after 21 days of transplanting.
- Every time match colour of the ten intact leaves with LCC shade 3.5 (for CSR 30) and LCC shade 4 (for Punjab Basmati 7, 5 and Pusa Basmati 1121, 1509, 1637 and 1718).
- When ever the greenness of 6 or more out of 10 leaves is lighter than the specified LCC shades, apply 9 kg urea per acre.
- No urea should be applied if colour of 6 or more out of 10 leaves is equal to or darker than specified LCC shades.
- Use of LCC should be discontinued after initiation of flowering and no more urea should be applied.

Note:

- The LCC is highly beneficial for optimum fertilizer nitrogen applications in fields amended with

follow the recommendations as given under puddled transplanted rice (Page 10).

PAU-Leaf Colour Chart (PAU-LCC) for need based Urea application

- No urea should be applied at the time of sowing.
- After four weeks of sowing, apply 25 kg urea per acre.
- After six weeks of sowing, start matching colour of the topmost fully exposed intact leaf of the randomly selected ten rice plants with PAU-LCC under shade of your body at 7 day interval.
- Whenever the greenness of 6 or more out of 10 leaves is lighter than the LCC shade 4, apply 30 kg urea per acre.
- No urea should be applied if colour of leaves is equal to or darker than the LCC shade 4.
- Use of LCC should be discontinued after initiation of flowering and no more urea should be applied.

Note: The leaves selected for measuring leaf greenness should be free from insect/disease incidence. There should not be water stress to the crop and nutrients other than nitrogen should be supplied as per recommendations. The PAU-LCC can be purchased from PAU Seed Shop at Gate No. 1, *Krishi Vigyan Kendras* and Farm Advisory Service Centres in different districts.

• **Irrigation**

1. Direct seeding (flat/raised beds) in tar-wattar fields: Apply first irrigation at around 21 days after sowing. After that, apply irrigations at 5-7 days interval depending on soil type.

2. Direct seeding in dry fields: Apply first irrigation immediately after sowing and second irrigation at 4-5 days after sowing. Subsequent irrigations should be applied at 5-7 days interval depending on soil type.

The irrigation interval may be adjusted according to rainfall. Stop irrigation 10 days before harvesting. In this way, DSR saves around 10 to 20% irrigation water as compared to puddled transplanted rice.

For sub-surface drip irrigation and fertigation in zero till DSR, see chapter on 'Multiple Cropping' under zero till direct seeded rice-wheat cropping system.

- **Rodent management:** Rodents cause damage to direct seeded rice crop at germination stage. Control weeds and rebuild bunds to destroy rat burrows and reduce their height and width. Do burrow baiting during lean period (May-June) as per the method given in chapter 11 "Management of Rodents and Birds".
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c) Chemical Fertilizer: Apply fertilizer on soil test basis (See Chapter on 'Soil Testing'). However, in the absence of soil test, apply fertilizers as under:

Varieties	*Nutrients (kg per acre)			Fertilizers (kg per acre)				
	N	P ₂ O ₅	K ₂ O	Urea	DAP	or Single Super phosphate	or Nitro phosphate	Muriate of potash
PMH 1, 11, 13 & 14, ADV 9293, JC 12, and Punjab Sweet Corn 1	50	24	12	110	55	150	125	20
PMH 2, JC 4, Punjab Baby Corn 1 and Pearl Popcorn	35	12	8	75	27	75	62	15

* These nutrients can also be supplied from other fertilizers available in the market.

Note

- Apply potassium only if the soil-test shows deficiency of potash.
- If maize follows wheat, which had received the recommended dose of phosphorus, omit its application to maize. When 27 kg of DAP is used, reduce the urea dose by 10 kg and when 55 kg of DAP is used, reduce the dose of urea by 20 kg. When 125 kg nitrophosphate is used reduce urea dose by 50 kg and when 62 kg nitrophosphate is used reduce urea by 25 kg.
- In phosphorus and sulphur deficient soils apply sulphated P fertilizer (13:33:0:15:N:P₂O₅:K₂O:S) if other phosphorus or sulphur containing fertilizers are not available.

To all recommended varieties, drill one-third of nitrogen and the entire quantity of phosphorus and potassium at the time of sowing. If nitrophosphate is used omit urea application at sowing. Top dress one-third of nitrogen at the knee-high stage and the remaining one-third at the pre-tasseling stage.

PAU-Leaf Colour Chart (PAU-LCC) for need based Urea application

- Apply basal dose of 25 kg urea per acre.
- Start matching colour of the first fully exposed leaf from the top with the LCC at 10 days interval after 21 days of sowing.
- Whenever the greenness of 6 or more out of 10 leaves is lighter than LCC shade 5, apply 25 kg urea per acre.
- No urea should be applied if colour of leaves is equal to or darker than LCC shade 5.
- Use of LCC should be discontinued after initiation of silking and no more urea should be applied.

Note: Always match colour of the leaf with PAU-LCC under shade of the body. The leaves selected for measuring leaf greenness should be free of insect-pest disease incidence. There should not be water stress to the crop and nutrients other than nitrogen should be supplied as per recommendations.

The PAU-LCC can be purchased from the PAU Seed Shop at Gate No. 1, PAU, Ludhiana, *Krishi Vigyan Kendras* and Farm Advisory Service Centres in different districts.

Zinc Deficiency: The deficiency symptoms appear within 2 weeks of seedling emergence. A broad band of white or very light-yellow tissue, with reddish veins appears, on each side of the midrib, beginning at the base of the second or third leaf from the top of the plant. The white patch later extends in stripes towards the tip parallel to the midrib. The midrib and the leaf margin remain green. The plants remain stunted and have short

consuming about 4 liters/hr of diesel initially for 1 hr. A provision of heat recovery from flue gases ensures higher fuel efficiency with reduced diesel consumption to about 2 litres/hr later on. The dryer can be operated both with tractor PTO or electricity. One each of skilled and unskilled labor is required to operate this dryer.

Baby Corn

Baby corn is the young ear of female inflorescence of maize plant harvested before fertilization when the silks have just emerged. The dehusked young ear is eaten raw as salad and used for cooking as vegetable, preparing pickle, *pakora* and soup. Baby corn salad and soup is delicacy in hotels, air lines and shipping companies because of its crispiness and sweet flavour. Baby corn has export potential as it is extensively consumed in developed countries. The crop raised for baby corn is completed in about 60-65 days and rest of the plant can be used for feeding cattle.

Punjab Baby Corn 1 and Parkash are appropriate hybrids for taking baby corn crop, which give on an average 8.4 and 7.0 quintals per acre, respectively yield of dehusked ears.

Note: Get certified seed of hybrids from PAU or Punjab State Seed Corporation. If the grain-produce of a hybrid crop is used as seed, it will give 15 to 20 per cent less yield.

The sowing of baby corn crop can be done at any time during April to first week of August. It is possible to have two or more crops from the same piece of land as this crop completes in less than 60 days. Staggered sowing should be done to maintain the supply as per demand. Sow the crop having row to row spacing of 30 cm and plant to plant of 20 cm using 20 kg seed per acre. Apply 24 kg N (52 kg urea) per acre in two equal splits i.e. at sowing and knee high stage. Use PAU-Leaf colour chart (PAU-LCC) for need-based urea application as below:

- Apply basal dose of 18 kg urea per acre at the time of sowing.
- Match colour of the youngest leaf (with fully exposed collar) from the 10 randomly selected baby corn plants with PAU-LCC shade 5, starting from 21 days after sowing for spring and summer season while 28 days after sowing for winter season up to initiation of silking stage at 10-day interval.
- Whenever the greenness of 6 or more out of 10 leaves is less than LCC shade 5, apply 18 kg urea per acre.
- No urea should be applied if leaf colour is equal to or darker than LCC shade 5.
- Use of LCC should be discontinued after initiation of silking and no more urea should be applied.

Note: Always match colour of the leaf with PAU-LCC under shade of the body. The leaves selected for measuring leaf greenness should be free of insect-pest or disease incidence. There should not be water stress to the crop, and nutrients other than nitrogen should be supplied as per recommendations. The PAU-LCC can be purchased from PAU Seed Shop at Gate number 1, PAU Ludhiana, KVKs and FASCs of PAU in different districts of Punjab.

Pick the young baby corn ears just at the silk emergence stage and ears picked later on would be pithy, woody and of poor quality. Take only three picks from each plant as ears appearing later are not of good quality. It is important to remove the tassel as soon as it

For control of weeds particularly *itsit*, *madhana/makra*, apply 1.0 litre per acre Stomp 30 EC (pendimethalin) as pre-emergence within 24 hours of sowing. In situations where weeds emerge after first irrigation or with the rain shower, Stomp 30 EC can also be applied as post-emergence after first irrigation in 200 litre of water. If some weeds emerge before the application of the herbicide, a light hoeing/interculture may be done. The herbicide can also be sprayed with tractor mounted sprayer fitted with flat fan nozzle either in morning or evening hours. Ensure a fine seed bed free from plant residues and clods, adequate moisture in the field at the time of spray of herbicides.

Alternatively, spray 500 ml per acre Hitweed Maxx 10 MEC (pyrithiobac sodium 6%+quizalofop ethyl 4%) by dissolving in 150 litres of water after first irrigation, in moist soil, to control annual grass and broadleaf weeds. This herbicide also provides effective control of *lapeta (guara) vel (Ipomoea sp.)* when weed plants are at 2 to 5 leaf stage.

Alternatively, at 6-8 weeks after sowing when the crop is about 40-45 cm in height, spray 500 ml per acre Gramoxone 24 SL (paraquat) or 900 ml per acre Sweep Power 13.5 SL (glufosinate ammonium) in 100 litres of water as a directed spray to control weeds in between the crop rows. The directed spray can be done by using a protective hood. Paraquat and glufosinate are non-selective herbicides and can cause injury to the crop if these fall on the crop leaves.

Fertilizer Application: Apply fertilizer on soil test basis (See Chapter on 'Soil Testing'). The fertilizer recommendations for medium fertility soils are as under:

	*Nutrients (kg per acre)		Fertilizers (kg per acre)		
	N	P ₂ O ₅	Urea	DAP	or Single Superphosphate
Non-Bt varieties	30	12	65	27	75
Bt varieties	37	12	80	27	75
Bt hybrids	42	12	90	27	75

* These nutrients can also be supplied from other fertilizers available in the market (Appendix VII).

Note:

- Omit application of phosphorus to cotton when it follows wheat which had received recommended dose of phosphorus. Where 27 kg DAP is used, reduce the urea dose by 10 kg.
- Apply 20 kg muriate of potash and 10 kg zinc sulphate heptahydrate (21%) or 6.5 kg zinc sulphate monohydrate (33%) per acre to cotton in light soils.

Drill all phosphorus at sowing. Apply 25 kg magnesium sulphate as basal dose at the time of sowing. Apply half nitrogen at thinning and remaining half at the appearance of flowers. If the soil is low in fertility, the first half dose of nitrogen may be applied at sowing instead of at thinning.

Apply 400 g boron (4 kg borax) per acre at sowing to boron deficient (<0.5 kg available boron per acre) calcareous soils having 2% or more calcium carbonate. However, boron should not be applied indiscriminately, as excessive boron application may cause toxicity.

PAU-Leaf Colour Chart (PAU-LCC) for need based Urea application

- Match leaf colour greenness of the topmost fully developed intact leaf from the randomly

selected ten cotton plants with PAU-LCC under shade of your body at thinning and initiation of flowering.

- Apply urea based on leaf greenness of six or more leaves out of ten leaves as per following table:

Leaf Colour as per PAU LCC	More than LCC shade 4.5	LCC shade 4.5	LCC shade 4.0	LCC shade 3.5 or below
Urea dose (Kg per acre)	0	20	35	50

Note: The leaves selected for measuring leaf greenness should be free from insect/disease incidence. There should not be water stress/logging and nutrients other than nitrogen should be supplied as per recommendations. The PAU-LCC can be purchased from PAU Seed Shop at Gate No. 1, *Krishi Vigyan Kendras* and Farm Advisory Service Centres in different districts.

To get higher yields, give 4 sprays of 2% potassium nitrate (13:0:45) at weekly interval starting at flower initiation. For high yield and management of leaf reddening in Bt cotton, give 2 sprays of 1% magnesium sulphate (1 kg magnesium sulphate in 100 litres of water per acre) at 15 days interval during full bloom and boll development stages.

Use of growth retardant

In heavy soils, cotton attains excessive vegetative growth during rainy season. Thick crop canopy prevents the penetration of sunlight which results in shedding of flower buds, flowers or bolls and ultimately causes yield reduction. To check excessive vegetative growth in heavy soils, give 2 sprays of 300 ml per acre Chamatkar (mepiquat chloride 5% w/w) at 60 and 75 days after sowing using 80-100 litres of water.

Irrigation and Drainage

Cotton requires 4-6 irrigations depending upon the seasonal rainfall. The first irrigation should be given 4 to 6 weeks after sowing and the subsequent ones at interval of two or three weeks. However on light soils or in crop sown on ridges, the first irrigation may be advanced, if necessary. Sowing cotton on ridges and irrigation in furrows save considerable amount of water. Under poor quality irrigation water conditions, give pre-sowing irrigation with canal water and subsequent irrigations can be applied with poor quality tube well water in alternate furrows. In soils irrigated with saline water (EC upto 10 dS/m), application of 16 quintal per acre of rice-residue biochar reduces adverse affect of salinity and increases seed cotton yield.

The crop must not be allowed to suffer from water stress during the flowering and fruiting stages, otherwise a lot of shedding of flowers and bolls will take place resulting in low yield. Cotton during its early growth is very sensitive to water stagnation. Therefore, drain out the stagnant water if such a situation arises. To hasten boll opening, give the last irrigation by the end of September.

Water stress management through Salicylic acid: To minimize loss of cotton yield owing to water stress (due to no rainfall or sudden canal closures), dissolve 12.5 g Salicylic acid in 375 ml of Ethyl alcohol and then add it to 125 litres of water for spraying crop per