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Overview

Pulses, the major source of vegetable protein, were grown in Punjab on 1016 thousand ha and their production was 331 thousand tones during 2015-16. There are two major pulses production zones in Pakistan. One zone comprising districts of Bhakkar, Khushab, Layyah, Mianwali and Jhang is producing more than 90% chickpea and 80% mung. The other zone comprising Sialkot, Narowal, Chakwal and Rawalpindi districts is producing more than 90% Lentil and Mash. Research on pulse crops was started during 1938 in cereal section. During 1970-71, independent pulses research section was established which was upgraded to Pulses Research Institute, Faisalabad during 1982. Pulses Research Institute has four sub-stations; at Kallurkot (Bhakkar), Rakhuttra (Khushab), Sahowali (Sialkot) and Farooqabad (Sheikhupura). Since its inception Institute has developed 19 varieties of pulses covering 90% area of Punjab and 80% of Pakistan. The institute is internationally recognized as premier institute of Pulses Research in Pakistan. Main objectives of the institute are to evolve pulses varieties with high yield potential, better quality and resistance against biotic (blight, rust, wilt and viruses) and abiotic (drought, cold and heat) stresses and soil disordered. Pulses Research Institute has also developed new promising/ advanced lines of different pulse crops which may come up as candidate future varieties. A new desi chickpea variety “ Bittal 2016” has been approved for general cultivation by Punjab Seed Council. New desi chickpea lines D-10008, kabuli chickpea line K-09012 and lentil line V-11508 got 1st positions in concerned National Uniform Yield Trials. Forty demonstrations trials of mungbean intercropping in sugarcane were conducted in district T. T. Singh and Forty four demonstration trials of mungbean as a catch crop in rice wheat system were conducted in Gujranwala and Shiekhupura area.

New Chickpea Desi variety

“Bittal-2016”

A bold seeded Chickpea desi Advance line D-03009 was approved as a variety with the name “**Bittal-2016**” for general cultivation. This variety has high yield potential of more than 4000 kg/ha.



Bittal-2016



Bittal-2016

Mung intercropping in sugarcane

Forty demonstration trials were conducted in district T.T.Singh. The mungbean yield in these trials was 150-260 kg/ha giving farmers additional income of about Rs. 10000-18000 per Acre



Mungbean intercropping in sugarcane

CHICKPEA (Desi) (*Cicer arietinum* L)

New Chickpea Advance Lines

This institute contributed five advance lines in the National Uniform Yield Trials (NUYT) 2015-16 to test their performance at different ecological zones. Two Advance line D-010008 (1964 kg/ha) and D-09027 (1895 kg/ha) contributed by this institute secured top two positions In NUYT-2015-16. Both entries also remained tolerant to disease Ascochyta Blight in the field.

Germplasm studies and advancement of breeding material:

Two hundred and seventy five (275) genepool entries were characterized and maintained in order to find desirable parents for utilization in hybridization scheme. Twenty three (23) F₀ and Sixteen (16) F₁ crosses were harvested successfully for advancement to F₁ and F₂ generations, respectively.

In F₂ generation, twenty-three (23) cross combinations were harvested for advancement to F₃ filial generation. More than one thousand (1000) single plant progenies were harvested from F₂ to F₅ generations for further selection and generation enhancement. Thirty six (36) uniform lines were selected from F₆ for assessing yield potential in preliminary yield trials.

Station Yield Trials:

The objective of these trials was to evaluate the promising lines for yield potential and disease tolerance. Two Preliminary Yield Trials (PYT-I & PYT-II) and one Advance Yield Trial were conducted at Pulses Research Institute (PRI) Faisalabad and Gram Breeding Research Sub-Station (GBRSS) Kallurkot both the Preliminary Yield Trials thirty-six (36) entries were evaluated against checks varieties.

Entry D-15020 (1845 kg/ha) gave overall higher yield than better check Bhakkar-2011 (1516 kg/ha). Five entries performed better than the check entry on overall yield basis ranging from 1604-1845 kg/ha.

In Advance Yield Trial eleven (11) entries performed better than the check entry on overall yield basis. Entry D-13030 (2576 kg/ha) produced highest grain yield as compared to the Check entry Punjab-2008 (2149 kg/ha).



Chickpea field in Thall

Adaptation Yield Trials 2015-16:

A cooperative yield trial was conducted at twelve (12) different agro-ecological location of Punjab with the collaboration of other sister organizations. PRI contributed 10 advance lines out of 20 entries. Advance line D-12011 with (1108 kg/ha) ranked 2nd in Co-operative Yield Trial and out yielded the check Punjab-2008 (1003 kg/ha).

Seed production

A total of 6050 kg pre-basic and basic seed of chickpea Desi varieties Punjab 2008 (3650 kg), Bittal-98 (900 kg) and Bittal-2016 (1500 kg) was produced.

CHICKPEA Kabuli (*Cicer arietinum* L.)

New chickpea kabuli advance lines

Three chickpea kabuli advance lines were contributed in NUYT which was conducted on 10 locations in different ecological zones of Pakistan. On the basis of average grain yield data, the entries contributed by Pulses Research Institute, Faisalabad got top three positions. Entry K-09012 (1357 kg/ha) occupied 1st, K-09015 (1356 kg/ha) 2nd, while K002-10 (1355 kg/ha) 3rd positions.



K-09012

Germplasm studies and advancement of breeding material:

Two hundred and ninety-two (292) genepool entries were characterized and maintained in order to find desirable parents for utilization in hybridization scheme. Nineteen (19) F₀ and fourteen (14) F₁ crosses were harvested successfully for advancement to F₁ and F₂ generations, respectively. In F₂ generation, twenty-two (22) cross combinations were bulked separately for advancement to F₃ filial generation. Out of 351 single plant progenies, 340 single plants were selected from F₃ to F₅ for generation advancement. From F₆, thirty two (32) uniform lines were selected from sixty-six (66) advanced breeding lines for assessing yield potential in preliminary yield trials.

Station Yield Trials:

The objective of these trials was to evaluate the promising lines for yield potential and disease tolerance. In Preliminary Yield Trials (PYT-I & PYT-II), conducted at Pulses Research Institute (PRI) Faisalabad and Advance Yield Trials (AYT) conducted at PRI, Faisalabad, GBRSS, Kallurkot and BARI, Chakwal, thirty-four (34) and fourteen (14) entries including checks were evaluated, respectively. Entry K-01510 (1857 kg/ha) in set-I and K-01530 (1790) in set-II gave overall higher yield than better check Noor-2009 (1836 kg/ha) in set-I and (1368 kg/ha) in set-II in Preliminary Yield Trials, respectively. In Advance Yield Trial, three (3) entries performed better on overall yield basis ranging from 1786-1988 kg/ha than the superior check Noor-2009 (1679 kg/ha).

Adaptation Yield Trials 2014-15:

In Micro Yield Trials conducted at PRI, Faisalabad, GBRSS, Kallurkot, AZRI, Bhakkar and BARS, Fateh-Jang, six test entries i.e. K-01242 (1837 kg/ha),

K-01248 (1821 kg/ha), K-01241 (1775 kg/ha), K-01338 (1735 kg/ha), K-01219 (1629 kg/ha) and K-01250 (1618 kg/ha), overall performed better over superior check, Noor-2013 (1570 kg/ha). In cooperative yield trials conducted at ten (10) different agro-ecological zones of Punjab, test entries K-01211 (1205 kg/ha) and K-01209 (1184 kg/ha) occupied first two positions, respectively and out yielded the check, Noor-2013 (914 kg/ha).

Seed production

A total of 1400 BNS, pre-basic and basic seed of chickpea kabuli variety, Noor-2013 was produced.

LENTIL (*Lens culinaris .L*)

New Advance lines

Pulses Research Institute, Faisalabad contributed four advance lines, V-10502, V-11501, V-11508 and V-11513 to the NUYT. The Advance line V-11508 yielded 1222 kg/ha was ranked 1st while V-11513 yielded 1187 kg/ha and was ranked 2nd.



V-11508

Germplasm studies

Lentil Germplasm comprising of 215 lines was maintained, characterized and utilized in hybridization. Days to 50% flowering (72-108), days to maturity (135-160), plant height (20cm - 40cm), 1st pod height (10cm - 23cm), No. of primary branches/plant (6-18), No. of secondary branches/plant (10-26), No. of pod/plant (50-280), No. of seeds/pod (1-2), seed yield/plant (2.5g- 5.0g) and 1000-grain weight (15g- 29g) were recorded.

Hybridization and filial generations

This study was designed to develop new genotypes and to select recombinants with desirable traits in segregating population. Fifteen new cross combinations were successfully harvested for future selection in segregating generations. Whereas 500

single plant progenies from F2 to F6 were evaluated/ selected for further studies in regular yield trials.

Preliminary Yield Trial

In Preliminary yield trial, fifteen entries including two checks were evaluated. Entries V-15510 and V-15502 gave significantly higher yield (568 and 508 kg/ha respectively) than high yielding check Pb.M-2009 (354 kg/ha).

Advanced Yield Trial

In Advanced yield trial fourteen entries including two checks were evaluated. The lines V-14501 and V-14503 gave higher yield 443 kg/ha and 360 kg/ha, respectively than all other entries including the high yielding check Pb.M-2009 which yielded 179 kg/ha.

Micro Yield Trial

In Micro yield trial twelve entries including two checks were evaluated at three different locations. Entries V-13514 and V-13516 secured top two positions by yielding 778 kg/ha and 776 kg/ha, respectively. than all other entries including the high yielding check Pb.M-2009 which yielded 775 kg/ha



Lentil Yield Trials

Evaluation of Advanced Lines of Lentil against Drought

Sixteen entries were studied for drought tolerance. Entries were sown in well prepared soaked soil and after sowing no irrigation was applied. Entries V-12514 and V-12505 gave high yield 1161 kg/ha and 993 kg/ha respectively.



Punjab Masoor 2009 at Farmer Field

Seed Production

About 900 Kg seed of Punjab Masoor 2009 was produced in order to supply seed of approved variety to the public and private sector seed producing companies to maximize the seed production of lentil in the country

MUNGBEAN (*Vigna radiata* L. Wilczek)

Evaluation of Germplasm

One hundred and seventy (170) entries were maintained and evaluated during Kharif season. On the basis of superiority for different traits, eleven genotypes were selected for hybridization program.

Study of filial generation

Seven new crosses were attempted however six successful crosses were harvested. Four hundred single plant progenies were selected from F1 to F6 generations for future studies.

Advance and preliminary yield trials

In advance yield trial 11 entries were tested at two locations, Kallurkot and Faisalabad. Six advance lines (13009, 13002, 13004, 13010, 13011 and 12005) surpassed the better check; AZRI M. 06 with respect to yield. In preliminary yield trial, check NM-11 gave the highest yield of 828 kg/ha.

Micro yield trial

In micro yield trial 10 entries were tested, out of them 8 entries viz: 12005, 12001, 12009, 12002, 12008, 12007, 12004 and 12006 gave higher yield (1593, 1542, 1532, 766, 718, 694, 680 and 643kg/ha, respectively than the checks; AZRI-06 and NM-11 (614 and 586 kg/ha).

Seed production

200 kilogram pre-basic and 6500 kg basic seed of AZRI M-2006 was produced.



Mung advance line V-08009

MASH (*Vigna mungo* L. Wilczek)

Germplasm studies

Mash Germplasm comprising of 112 lines was maintained, characterized and utilized in hybridization. Plant height (20 cm -70 cm), No. of pods/plant (11-40), no. of seeds/pod (4-6), 1000 grain weight (25-45 g), yield/plant (2.50-13.80 g), days to flowering (35-50), days to maturity (90-120) and harvest index (6.87-30.32%) were recorded.

Hybridization and study of filial generations

This study was designed to create variability by making crosses among the elite lines/ cultivars. Fifteen cross combinations were attempted and 6 successful crosses were harvested for further studies. Whereas 71 single plant progenies from F₂ to F₆ were evaluated/selected for further studies.

Preliminary yield trial

In Preliminary yield trial ten entries including check were evaluated at Faisalabad and Kallurkot. Entries 15M005 and 15M007 gave significantly higher yield (588 and 572 kg/ha respectively) than check Arooj (529 kg/ha).

Advanced yield trial

In Advanced yield trial nine entries including check were evaluated at two different locations. The line 14M007 gave higher yield 599 kg/ha than all other entries including check Arooj which yielded 557 kg/ha.

Micro yield trial

In Micro yield trial 10 entries including check were evaluated at two different locations. Entry 13M001 secured top positions by yielding 589 kg/ha followed by 13M007 which yielded 578 kg/ha.

Seed production

About 200 Kg prebasic seed of Arooj and 100 Kg of M-97 was produced whereas 1695 kg basic seed of Arooj and 840 kg basic seed of Mash 97 was produced.



Arooj-2011 at bloom

COWPEAS (*Vigna sinensis*)

Testing of advanced lines in yield trials

In preliminary yield trial, 3 genotype gave higher yield than the check SA Dandy (918 kg/ha). Maximum yield was given by CP-009 (1129 Kg/ha). In advance yield trial 4 entries outyielded the check variety S.A. dandy (975 kg/ha). Maximum yield was given by Cp-030 (1148 kg/ha) In micro yield trial 8 entries were tested with check S.A. Dandy, CP-037 gave higher yield (1132 kg/ha) than the check (889 kg/ha).



Cowpea Line CP-037

DRYPEAS (*Pisum sativum* L.)

Maintenance and evaluation of germplasm

Sixty genotypes of dry peas (*Pisum Sativum* L.) were maintained and evaluated for different characteristics. In hybridization programme, 16 new/fresh crosses were made successfully and Ninety seven crosses from F₁ to F₆ were studied.

Preliminary Yield Trial

Sixteen advanced lines were evaluated, DP-02-15 and DP-03-15 were highest with respect to yield of 746 kg/ha and 664 kg/ha respectively. The Check “NO.267” had yield of 273kg/ha.

Advanced Yield Trial

In Advance Yield Trial, fourteen advanced lines were evaluated, DP-08-14 and DP-01-14 were highest in yield of 753 kg/ha and 612 kg/ha respectively. Check had the lowest yield of 125 kg/ha.

Micro Yield Trial:

In Multilocation Yield Trial, Twelve lines were evaluated, DP-01-13 and DP-01-12 were highest in yield of 1080 kg/ha and 1050 kg/ha respectively.

PLANT PATHOLOGY

Main emphasis was given on selection of disease resistant/ tolerant lines at various selection stages against major diseases under natural as well as under tunnel conditions. Also work was done to manage the different root complex diseases in different pulse crops.

Evaluation of Mungbean (*Vigna radiata* (L.) Wilczek) promising lines/ varieties for tolerance to Mungbean Yellow Mosaic Virus (MYMV) and Urdbean Leaf Crinkle Virus (ULCV)

During the 1st week of July, each entry was sown in 3 meter long and 0.30 m apart single row replicated thrice. Mung Kabuli, highly susceptible to MYMV was sown as spreader after every two test entries. Total 07 lines/varieties of Mungbean were evaluated against MYMV and ULCV. Five lines (7006, 8009, 1009, AZRI-06 and NM-11) were Moderately Resistant and two lines (11002 and 7008) were found susceptible against MYMV as shown below . Urdbean Leaf Crinkle Virus was not observed on the Mungbean lines.



MYMV on mungbean

Evaluation of Mash (*Vigna mungo* (L.) Hepper) lines/ varieties for tolerance to Urdbean Leaf Crinkle Virus (ULCV) and Mungbean Yellow Mosaic Virus (MYMV)

Each entry was planted in 3 meter long and 0.30 m apart single row during the 1st week of July. A highly susceptible variety kandhari Mash was sown as spreader after every two test entries. The trial was replicated thrice. Out of 10 test entries evaluated against MYMV and ULCV, 02 lines (13M002 and 13M003) were Resistant, 05 lines (13M001, 13M007, 13M008, 14M001 and 15M006) were Moderately Resistant and 03 lines (14M002, 15M002 and 15M007) were found Moderately susceptible against MYMV. Urdbean Leaf Crinkle Virus was not observed on the Mashbean lines.



Mash bean screening lines against MYMV

Evaluation of Cowpeas (*Vigna sinensis*) promising lines for tolerance to Cowpea Yellow Mosaic Virus (CYMV)

Each entry was planted in 3 meter long and 30cm apart single row during the 1st week of July. These entries were replicated thrice. A highly susceptible Desi Arvan was sown after every two test entries as spreader. Fourteen test lines were evaluated against CYMV and all the lines were found highly resistant.



Cowpea Yellow Mosaic Virus screening

Management of Cercospora leaf spot (*Cercospora canescens*) in Mungbean (*Vigna radiata* (L.) Wilczek) by using protective fungicides

Cercospora leaf spot (CLS) susceptible variety C₂-94-4-36 was sown in RCBD having 3 replications with 1x4m subplots in three sets. The test fungicides were sprayed before the appearance of the disease. Disease was not observed due to unfavorable environmental conditions.

Evaluation of Mungbean (*Vigna radiata* (L.) Wilczek) lines for resistance / tolerance to Cercospora leaf spot

Each entry was planted in 3 meter long and 30cm apart single row during the 1st week of July in two replications. A highly susceptible variety C₂-94-4-36 was sown after every two test entries. Out of 150 lines/varieties, no line was Highly resistant, Resistant or Moderately resistant. 77 were Moderately susceptible, 62 susceptible and 11 were found Highly susceptible.

Study of frequency of seed transmission of MYMV, ULCV and CYMV in Mung, Mash and Cowpea

Plants of Mung, Mash and Cowpea susceptible cultivars infected at seedling stage were marked. Seeds were collected, harvested and stored in separate paper bags after drying at room temperature. Seedlings will be grown in pots filled with sterile soil in an insect free environment in the next growing season.

Evaluation of chickpea lines/ varieties against Chickpea Blight under tunnel condition

The experiment was carried out under tunnel and disease was produced artificially. Spore suspension of *Ascochyta rabie* was sprayed on 172 test lines at 3 days interval till the initiation of disease. Fresh tap water was also sprayed daily to provide required humidity. Among 172 lines/ varieties, no line was highly resistant, 07 found resistant (13036,14008, 14011, 14013,14014,14015and pb-2008), 66 moderately resistant, 93 susceptible and 06 were highly susceptible



Eye shaped spot of blight on leaves & pods

Chickpea lines/ varieties against Wilt/ Root Rot diseases

The trial was sown in 3m × 0.30 m plot with 3 replications. AUG 424 was sown as check entry which

was repeated after every 2 lines. One hundred and seventy two chickpea lines/ varieties were screened out against root rot complex in a sick bed sown in 3 replications. Out of 172 lines/ varieties, no line was highly resistant, resistant or moderately resistant. 9 lines were susceptible and 163 were found highly susceptible.



Root rot symptoms

Screening of lentil germplasm against wilt and root rot diseases

The trial was sown in 3m × 0.30 m plot with 3 replications. M-85 was sown as check entry which was repeated after every 2 lines. Out of 45 germplasm lines, evaluated against root rot diseases, fourteen lines were highly susceptible, 12 susceptible, 08 moderately resistant, 11 resistant (15503, 15504, 15507, 15511, 13515, 14508, 14512, 13514, 13513, 13501, 13509 and NL2006) and no line showed highly resistant behavior.



Lentil screening germplasm

Screening of lentil germplasm against lentil rust (*Uromyces viciae-fabae* Pers.)

This trial was conducted at Adaptive Research Farm Kot Naina, Teh. Shakar Gargh. The trial was sown in 3m × 0.30 m plot with 3 replications. M-85 was sown as check entry and repeated after every 2 lines. Out of 45 lines, 8 were moderately resistant, 25 susceptible and 12 were found highly susceptible.



Lentil rust

ENTOMOLOGY

Identification of Chickpea (Kabuli) Advance Lines for tolerance against Pod Borer:-

Ten advance lines of chickpea (01302, 01206, 01219, 01308, 01221, 01241, 01309, 01242, 01240, 01219) were tested against pod borer on chickpea crop at Faisalabad. Layout system was RCBD having three repeats. Plot size was 4m×1.2 m. Pod borer infestation was recorded from 5 randomly selected plants per plot. The line 01302 and 01206 showed moderately resistance against pod infestation having minimum pod infestation 6.00 and 6.75 % respectively.

Identification of Chickpea (Desi) Advance Lines for tolerance against Pod Borer:-

Ten advance lines of chickpea (13034, 013035, 13007, 13004, 13006, 13029, 13011, 13012, 13029, 13031) were tested against pod borer on chickpea crop at Faisalabad. Layout system was RCBD having three repeats. Plot size was 4m×1.2 m. Pod borer infestation was recorded from 5 randomly selected plants per plot. The line 013034 and 13035 showed moderately resistance against pod infestation having minimum pod infestation 5.70 and 6.10 % respectively.

Identification of Lentil Advance Lines for tolerance against Aphid:-

Ten advance lines of lentil (13501, 13517, 13515, 13502, 13506, 13509, 13512, 13505, 13516, 13513) were tested against aphid on lentil crop at Faisalabad. Layout system was RCBD having three repeats. Plot size was 4m×1.2 m. Aphids population was recorded from 20 randomly selected branches per plot. The minimum population 0.50 and 0.60 aphids per branch were in lentil line 13501 and 135017 respectively.

Efficiency of some insecticides against white fly on mung crop:

Four insecticides and their combinations i.e. (Mospilan 20sp, Priority 10.8EL, Pyramid 10%SC, Confidor 200L, Priority 10.8EL+ Mospilan 20 SP, Priority 10.8EL + Confidor 200SL, Priority 10.8EL + Pyramid 10%SC) were applied against whitefly on mung crop at Faisalabad. Layout system was RCBD having three repeats. Plat size was 10m X 3 m. Whitefly population on per leaf basis was recorded before spray and than 3 and 7 of spray from 15 randomly selected leaves of 15 plants from each plot. All insecticides proved equally effective against the pest after 3 and 7 days of application. However whitefly mortality ranged 76 to 85 % and 75 to 88 % after 3 and 7 days of application respectively against check (0.00 %).

BACTERIOLOGY

Performance of mungbean under varying ratios of NPK with inoculation

Varying NPK ratios viz 0-0-0, 25-0-0, 0-60-0, 0-0-30, 25-60-0, 25-0-30, 0-60-30, 25-60-30 kg /ha were applied to mungbean. Inoculation gave higher number of branches/ plant, pods/ plant, grain/ pod, 100 grain weight and grain yield. Response of mungbean to NPK ratios varied for different parameters



Mungbean at different

growth stages

However, the highest grain yield was observed with the application of Phosphorus alone (60 kg/ha) and with inoculation.

Performance of chickpea under varying ratios of NPK with inoculation

Varying NPK ratios viz 0-0-0, 25-0-0, 0-60-0, 0-0-30, 25-60-0, 25-0-30, 0-60-30, 25-60-30 kg/ha¹ were applied to chickpea. Inoculation gave higher number of branches/ plant, pods/ plant, grains/ pod, 100 grain weight and grain yield. Response of chick pea to NPK ratios varied for different parameters. However, the highest grain yield was observed with the application of nitrogen alone (25 kg/ha) and with inoculation



Impact of cotton mungbean intercropping on yield and soil health

Treatments viz cotton alone T₁, Mungbean alone T₂, cotton + mungbean (1:1 row) T₃ and cotton + mungbean (1:2 rows) T₄ were maintained to see the impact of cotton mungbean intercropping on their yields, and cost benefit ratio. Cotton alone (T₁) gave the highest seed cotton yield followed by cotton + mungbean (1:1) T₃. Mungbean alone (T₂) gave the highest grain yield followed by cotton + mungbean (T₂ 1:2). Highest cost / Benefit ratio was observed in the treatment cotton + mungbean (1:1 row) T₃.





Use of Rhizobium and PGPR Co-inoculation for chick pea production

The trial was conducted to identify the best suited Rhizobium - PGPR co inoculation for optimum Chickpea production. Treatments viz control (25-60-0) T₁ , Rhizobium specie of chickpea (T₂) , Azotobacter (PGPR₁) T₃ and bacillus (PGPR₂) T₄, Rhizobium + PGPR₁ (T₅) and Rhizobium + PGPR₂ (T₆) were maintained, Rhizobium + PGPR₁ (T₅) gave the highest grain yield.

Impact of different doses of potash on grain yield and quality of lentil

Five levels of potash (0, 30, 45, 60 and 75 kg/ha) along with recommended dose of NP (25-60 kg/ ha) were applied to lentil have basal dose in order to see the impact of various levels of potash on grain yield and grain quality. Result showed a gradual increase in grain yield and grain quality improvement (Crude protein, Crude fat, ash, calcium, potassium and phosphorus contents) with increasing potassium doses.

ONGOING PROJECTS

1. **PARB PROJECT-212**
Improvement of lentil germplasm for high seed yield and disease resistance.
2. **AIP-AVRDC MUNGBEAN PROJECT**
AIP-AVRDC Improved mungbean production
3. **ADP PROJECT 2273**
Promotion of pulses cultivation in Punjab.
4. **PARB PROJECTS-532**
Development of Short Duration, high yielding and disease resistant mungbean cultivars in Rice-Wheat Cropping system.

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