



**Barani Agricultural
Research Institute, Chakwal**



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ANNUAL ABRIDGED REPORT FOR THE YEAR 2016-17

Overview

Barani tract comprises of 3.10 million hectares out of total 11.38 million hectares under cultivation in Punjab, which is about 30% of the whole Punjab. It is further characterized by different ecological zones depending upon rainfall pattern. This Institute is composed of seven research divisions namely; Crop Breeding, Agronomy, Soil Science, Horticulture, Plant Protection, Agricultural Engineering, Agricultural Economic and Statistics to carry out the research work on cereal, oilseed, fodder, legume and horticultural crops. In addition, five Stations/ Sub-stations namely Barani Agricultural Research Station, Fatehjang, Groundnut Research Station, Attock, Horticultural Research Station, Nowshera, Khushab, Barani Agricultural Research Sub-Station, Piplan, district Mianwali and Hill Fruit Research Station, Sunny Bank, Murree are also working under this institute.

Approval of new Wheat Variety by Punjab Seed Council.

BARANI-17

A candidate line 11C023 with the proposed name “**BARANI-17**” has been approved by the Punjab seed council (PSC) in the meeting held at PSC, Lahore. It is a climate resilient with high protein contents variety. Other salient features of the variety are; high grain yielding, having tolerance against stem rust race Ug-99,

leaf and yellow rust, waxy leaves and good chapatti making quality.



Field evaluation of wheat variety BARANI-17

CURRENT RESEARCH PROJECTS

Wheat Productivity Enhancement Project (W-PEP)

Wheat Productivity Enhancement Project was launched to support wheat research activities in Pakistan by CIMMYT. Under the object of rust surveillance, two scientists of this institute surveyed Rawalpindi, Chakwal, Jhelum, Mianwali and Attock districts during March to monitor the occurrence of rust with the help of GPS tracker. During survey ten samples of leaf rust and forty four samples of yellow rust were collected and sent to Crop Diseases Research Institute Murree for race analysis. Under the breeding objective two hundred and fifty crosses were made to incorporate rust resistance and high yield potential in desirable genotypes. One thousand three hundred and seventy nine entries various national and international nurseries/trials were studied for their performance. Out of which eighty one entries were selected.

Agricultural Innovation Project (AIP)

The objective of the Diamond Trial was to create awareness among farmers through on-farm demonstration regarding the importance of certified seed and to popularize newly released varieties among farmers. Under AIP project, a diamond trial was conducted to compare between

the existing and the new varieties and their certified seeds and farmer saved seeds. The trial was conducted at seven locations in the districts of Chakwal and Attock. The data is given as under;

Location	Dharabi Certified (Kg/ha)	Dharabi Farmer (Kg/ha)	Chakwal-50 Certified (Kg/ha)	Chakwal-50 Farmer (Kg/ha)
Attock	3600	2760	2720	2040
Attock	3000	2120	2080	1200
Attock	2800	1800	1520	1000
Chawkal	2540	2130	2376	2090
Chawkal	2470	2253	1980	1742
Chawkal	3190	2466	2640	2376
Chawkal	2260	2175	2070	1861

Developing Potohwar into an Olive Valley

During the year, olive plantation on 2361 acres at 221 farmers' sites was achieved. Plantation on highest acres was achieved in Chakwal District on which 803 acres with 72 farmers was done whereas in Jhelum it was 719 acres with 64 farmers , in Attock at 586 acres with 58 acres.in Rawalpindi on 202 acres with 20 farmers whereas in Khushab it was 51 acres involving 7 farmers. Few constraints like delay in drip irrigation installation and water source development, plantation hampered the pace of plantation. The project help desk established at institute provided guidance to all interested farmers/visitors during the period.



Olive plantation and field inspection

Introduction and Adaptation of High Value Crops and Fruits in Climatic Conditions of Punjab

The five-year ADP project was approved during 2015-16 at a total cost of Rs. 34.565 million for introduction and evaluation of promising international cultivars of Avocado, Chiku, Nectarine/peaches, Pistachio, Berries, Passion fruit, Mangosteen, Fig for adaptability, fruit yield and quality. During the financial year 500 plants of various fruit plants were imported and acclimatized and are being evaluated for adaptability.



View of various high-value fruit plants

Impact of managed pollination by *Apis mellifera* L. on the yield of different crops

The three-year PARB project was approved during 2016 at a total cost of Rs. 14.413 million for the impact of managed pollination by *Apis mellifera* L. on the yield of different crops. During the financial year survey were conducted at Dhudial area and evaluated knowledge and skill of different farmers and beekeepers. Total 15 beekeepers and 15 farmers were visited from Chakwal area. Information gathered regarding their education, economics and knowledge about honeybees' services and evaluated problems in terms of economics. Contribution of *Apis mellifera* in pollination of cucurbits crops at BARI Chakwal were evaluated by assessing pollinators' diversity and density in cucurbits crops, flower attractiveness of cucurbits crops to different pollinators and pollination efficacy of *Apis mellifera* regarding productivity were calculated. Apiston strips were given to save bees

from diseases and sugar syrup in 1:1 was given for scarcity of food.

Insect visitors of cucumber bloom

Scientific name	Common name	Order	Family
<i>Apismellifera</i>	European bee	Hymenoptera	Apidae
<i>Apis dorsata</i>	Rock bee	Hymenoptera	Apidae
<i>Apis florea</i>	Dwarf bee	Hymenoptera	Apidae
<i>Aulacophora foveicollis</i>	Red pumpkin beetle	Coleoptera	Chrysomelidae

Relative abundance of insect visitors per 10min/m² cucumber bloom at different hours of the day

Day hours	10:00 am	12:00 pm	02:00 pm	Mean
<i>Apismellifera</i>	4.67	3.52	2.45	3.55
<i>Apis dorsata</i>	1.76	1.12	0.88	1.25
<i>Apis florea</i>	1.24	0.75	0.43	0.81
<i>Aulacophora foveicollis</i>	1.82	1.53	1.11	1.48
Mean	2.37	1.73	1.22	1.77

Effect of different modes of pollination on fruit length, weight, diameter, 1000 seeds weight, seeds/fruit

Mode of pollination	Fruit length (cm)	Fruit weight (g)	Fruit dia. (cm)	1000 seed weight (g)	Seeds/fruit
Open pollination	19	268.83	4.43	28.1	424
No pollination (caged)	14.5	122.67	3.23	15.51	234.67

Protected cultivation of vegetables (AIP/AVRDC Project)

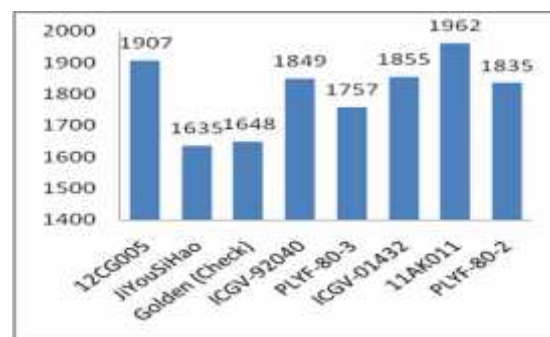
Six new tomato hybrids were introduced. T-1359 in F1 is high yielded hybrid and performed best. Four trainings were conducted for vegetable growers on nursery raising, management of off-season vegetable production and healthy seedling production for growing off-season tomatoes. 115 farmers were trained about vegetables production system under cover. Twenty direct beneficiaries were facilitated financially & technically by the Institute scientists. Under the project

varietal trials were successfully conducted and farmers were made aware of alternative varieties and their performance. Five vegetables including, tomato, cucumber, chillies, Onion & coriander were grown in the open-field off-season conditions through their traditional cultivation system. However, modern technologies related vegetable productions have been introduced like raising of Tomato and Coriander on ridges rather than on flat area by broadcast.

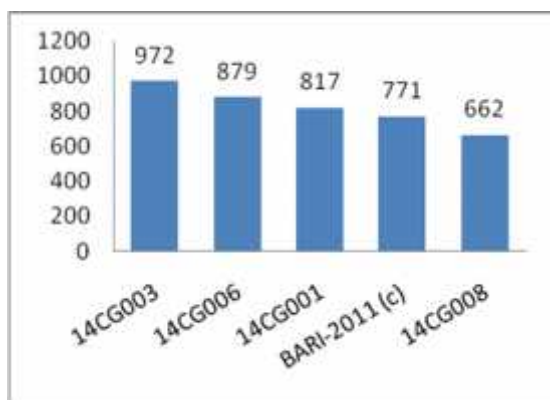
GROUNDNUT

Two hundred and twenty groundnut entries of diversified genetic background were studied for their characterization. All entries were retained on the basis of number of pods and yield per plant and will be further studied during the next year. Crosses were made among Six desirable varieties /advance lines and all crosses were successful. 106 progenies were selected from filial generations for further evaluation.

Nucleus seed of 35 kg BARI-2011, 40 kg of BARI-2016 was produced in 2016. Eight entries were evaluated against check variety in NUGYT sown at BARI, Chakwal, 12CG005 of this institute stood second for dry pod yield in NUGYT-2016 sown at 7 locations.



In groundnut micro yield trial 11 elite groundnut lines were studied and evaluated on the grain yield performance including the check variety BARI-2011. Three lines performed better and gave more yield than the check variety. Highest yielder 14CG003 gave maximum grain yield of 972Kg/ha whereas lowest yielder was 14CG008 with 662 Kg/ha.



Ground nut micro yield trial

HYBRIDIZATION IN GROUNDNUT



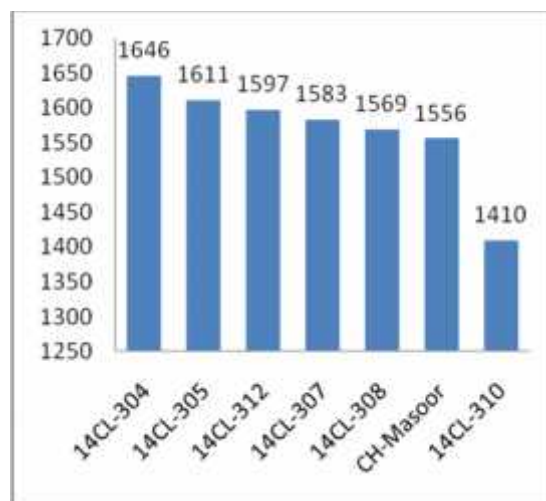
Crossing of Groundnut Elite Lines

LENTIL

Twelve new crosses of Lentil were attempted, all were successful and their seed was collected for further studies. Seventy two crosses / progenies of F₁, F₂, F₃, F₄ and F₅ generations were studied. Out of these, One hundred & ninety three single plants / lines were selected further

evaluation in F₁, F₂, F₃, F₄ and F₅ generations.

In micro yield trial, twelve entries were evaluated against check variety, Chakwal Masur. Five lines were selected due to their better yield performance. Maximum yielding elite line 14CL-304 (1646Kg/ha) whereas lowest yielder 14CL-310 (1410Kg/ha).



Lentil Micro Yield Trial 2016-17

SORGHUM

Six new crosses were attempted and harvested successfully for further studies. 135 kg nucleus seed of Chakwal sorghum was produced during the current year.

Six promising lines were evaluated for green fodder yield performance. Three lines 010CS033, 012CS048 and 09CS019 yielded better than check variety Chakwal Sorghum.

WHEAT

Regarding hybridization, 250 targeted crosses were successfully threshed for further studies. Eight hundred and ninety crosses / progenies of F₁, F₂, F₃, F₄ and F₅ generations were evaluated in the field.

Seven hundred and sixty three crosses / progenies were selected from these generations for further studies and inclusion in station yield trial.

Regarding evaluation of international trials / nurseries received from CIMMYT/ICARDA, a total of 1289 entries were evaluated and 68 were selected on the basis of yield and other traits desirable for rainfed areas for further evaluation in preliminary/regular yield trials.

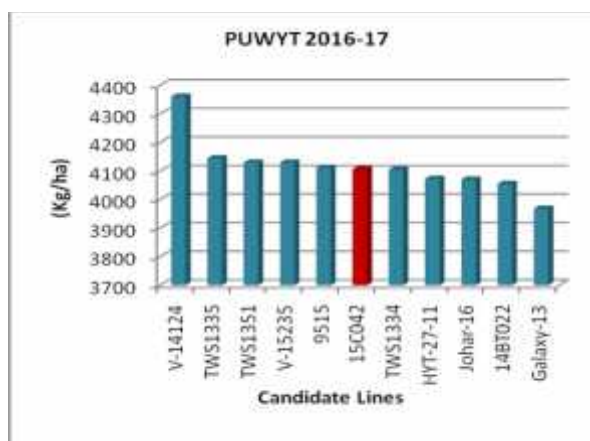
In preliminary yield trial, twenty five entries were tested for their grain yield performance under rainfed conditions and none of the entries gave higher yield than all the three checks included in the trial.

In regular yield trial, twenty five entries were tested for their grain yield performance under rainfed conditions and four entries viz; 16C036, 16C038, 116C039 and 16C040 gave higher grain yield than the three check varieties i.e. Ihsan-16, Chakwal-50 and Dharabi-11. Detail of trial is given below:

S #	Candidate Lines	Yield Kg/ha
1	16C036	5309
2	16C038	5457
3	16C039	5203
4	16C040	5159
5	Ihsan-16	5105
6	Chakwal-50	4955
7	Dharabi-11	5040

In Punjab Uniform Wheat Yield Trial, sixty entries from different institutes of Punjab were evaluated. Candidate line V-14124 gave the maximum yield of 4360 kg/ha followed by TWS1335 which produced 4144 kg/ha. The candidate line 15C042 from BARI, Chakwal produced the yield of 4106 kg/ha and got the sixth position in Punjab.

S #	Candidate Lines	Yield Kg/ha
1	V-14124	4360
2	TWS1335	4144
3	TWS1351	4129
4	V-15235	4129
5	9515	4111
6	15C042	4106
22	Galaxy-13	3968
60	A-24	3331

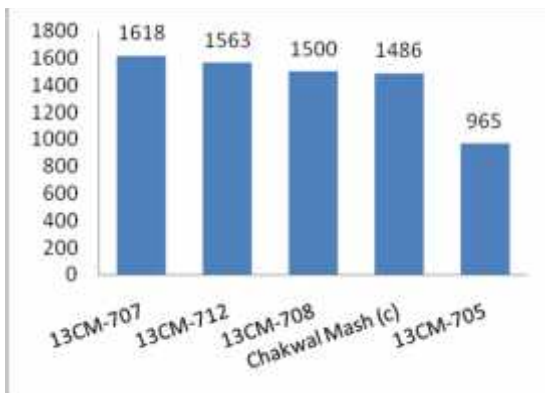


MASH

Ten crosses were attempted among the selected mash genotypes. All the crosses were successful and harvested for further studies in F₁ generation.

Eighty seven crosses / progenies of F₁, F₂, F₃, F₄, F₅ and F₆ generations were sown and studied. On field performance basis, 107 single plants / lines were selected for further evaluation in subsequent generations.

Twelve promising lines of mash were evaluated for their grain yield performance in micro yield trial against check variety Chakwal Mash . Three lines performed better than the check variety under rainfed conditions. Elite line 13CM-707 performed better and gave maximum grain yield of 1618Kg/ha, whereas lowest yielder 13CM-705 gave the grain yield of 965Kg/ha.



Mash Micro Yield Trail

OLIVE

The GPU was extended and the total number of olive varieties reached up to 69. During this year, 23 varieties gave fruit.

In the year under report, 4554 true to type olive plants of five promising varieties and 67296 imported olive saplings were distributed among 252 progressive olive growers of the Pothowar region and plantation was done on an area of 536 acres. The facility of oil extraction was provided to 19 olive growers for 1775 kg fruit, which was totally free of cost.

GRAPES

Nine new varieties of grapes were added in the genepool viz. Sable seedless, Monakka, Summer Royale, Sweet Celebration, Black Monakka, Fiesta, Suffolk, Fantasy and Princess Seedless. This year 25 grape varieties bear fruit. Current year Superior Seedless, Vitro Black and Sultanina-C varieties performed very well regarding fruit quality and yield. Multiplication blocks including 2750 plants of encouraging grapes varieties are established at the Institute to get maximum cuttings for nursery production.



Kings RUBY



Sultanina C



Vitro Black



Danlas

PEACH & NECTARINE

In the existing gene pool of 22 peach varieties, three exotic peach varieties; Pride, Long Beach and Best were added during previous year. Five exotic

Nectarine varieties were also added during the previous year i.e. Sunny, Fresh, May, Carne Blanca and Carne Amarilla.



Donut Peach



Nectarine

FIG

Fig is performing very well in the Pothowar region and require less irrigation as compared to other fruit crops of the region. Six fig varieties were imported and planted at the Institute during this year alongwith the existing varieties. Sarilop, Kadota, Verte, Negro, Blanco and Wegro varieties were planted in the field whichwil bear fruit in the next year.



CITRUS

In the existing gene pool, four new varieties of sweet oranges and one variety of mandarine (Clemenules) were planted at Institute including Parson Brown, Cassa Grande, Morro and Torrocco. Salustiana, Blood Red and Succari performed better than all other sweet orange varieties.



Salustiana

Meteorological Data for the year 2016-17

Month	Rainfall in mm	Temperature		Humidity %
		Minimum ⁰ C	Maximum ⁰ C	
July, 2016	269.2	23.6	35.3	73.4
August, 2016	101.2	22.5	34.4	71.5
September, 2016	61.4	21.3	35.1	67.2
October, 2016	0	14.5	33.0	56.8
November, 2016	2.1	8.6	21.1	60.7
December, 2016	0	4.5	23.2	67.2
January, 2017	48.1	4.2	15.4	86.0
February, 2017	25.1	5.8	21.0	68.2
March, 2017	11.5	9.4	25.7	62.0
April, 2017	94.3	15.4	31.5	47.0
May, 2017	92.1	21.3	37.3	47.1
June, 2017	50.7	23.2	36.0	54.7

Publications

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2. Aziz, M. M. Tariq, W. Ishaque. 2016. Optimization of wheat and barley production under changing climate in rainfed area of Punjab. A crop simulation modeling study. Annals of Arid Zone 55: 115-127.
3. Husnain, S. K., S. Ali, B. Ahmad, S. H. Khan, M. Iqbal. 2016. Genetic potential of chickpea germplasm against fusarium wilt (*fusarium oxysporum. f.sp. ciceris*). Pak. J. phytopathol. 28 (02): 275-281.
4. Husnain, S. K., S. H. Khan, S. Ali, M. Akhtar and M. Idrees 2016 Evaluation of wheat (*Triticum aestivum*) Varieties/lines against loose smut (*Ustilago tritici*) and its management by seed dressing fungicides. Accepted in Journal of Agricultural Research, Pakistan.
5. Raza, M. K., M. M. Khan, S. A. Naqvi, M. J. Jaskani, K. Mahmood, S. K. Husnain. 2016. Efficacy of citrus rootstocks against citrus canker (*Xanthomonas axonopodispv. Citri*) infestation. Pak. J. Phytopathol. 28 (02): 241-247.
6. Rehman, M.K., M.A. Ali, **A. Hussain**, W.A.Khan and A.M. Khan. 2016. Effect of different casing materials on the production of button mushroom (*Agaricus bisporous L.*). J. Environ. Agric. Sci. 7: 55-61.
7. Comparison of direct seeded and transplanted rice in response to Zinc under salt affected soil, M.ArshadUllah, I.A. Mahmood, B.U.Zaman, S.I Haider, M.Suhaib, A.Ali and M. Jamil Pak.J.Sci.ind.res .Ser. B: Biol.Sci 60(2): 116-118, 2017

8. Impact of sowing techniques and nitrogen fertilization on castor bean yield in salt affected soil, M.Jamil, S.S Hussain, M.A quershi, S.M Mehdi and M.Q. Nawaz JAPS 27(2): 451-456 2017
9. M. Sarwar, Shoaib Ahmed, M Arsalan, Mattiullah Khan. 2017. Humic acid affects zinc availability and wheat yield in zinc deficient calcareous soil. J. Appl. Agric. Biotechnol., 2(1): 19-25.
10. M. Sarwar, Shoaib Ahmed, M. Arsalan, M. Imran, M. Laeeq Hashmi. 2017. Humic acid in combination with phosphorus augments mungbean yield and nutrient uptake under rain fed conditions. J. Appl. Agric. Biotechnol., 2(1): 52-58
11. Muhammad Rizwan, Junaid Nawaz Chauhdary, UmerDraz Khan1 and Muhammad Arsalan. 2017. Effects of Different Tillage Implements on the Growth and Yield of Wheat in Cotton-Wheat Zone of Pakistan. Pak. J. life Soc. Sci., 15(1):7-10
12. Rhizobacteria containing ACC-deaminase confer salt tolerance to wheat (*Triticumaestivum*) grown on salt affected field M.Arshadullah, S.I. Hyder, I.A.Mahmood, T. Sultan and M.Jamil IJPBCS 4(2) : 256-260, 2017
13. Rice yield improvement through various direct seeding techniques on moderately salt affected soil , M.Jamil, S.S. Hussain, M.A quershi, S.M.Mehdi, M. Q. Nawaz and Q. Javaid JAPS, 27(3):848-854, 2017

TV/Radio talk	=	27
Urdu publications	=	19
Workshops/Conferences attended	=	24
Visits of different delegation	=	33