



**Barani Agricultural Research
Institute, Chakwal**



**Dr. Muhammad Tariq,
Director**
Off: +92-543-662004
Fax: +92-543-662002
Cell: +92-321-5365576
barichakwal@yahoo.com

ANNUAL ABRIDGED REPORT FOR THE YEAR 2017-18

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 nine samples of leaf rust and thirty seven samples of yellow rust were collected and sent to Crop Diseases Research Institute Murree for race analysis.

PARB Project No. 904 (Wheat Component)

Under the PARB Project No. 904 (Wheat Component), Collection of 100 wheat germplasm for the screening higher Zn and Fe contents has been done from various national and international (CIMMYT, ICARDA) sources.

Developing Potohwar into an Olive Valley

During the year, olive plantation on 3063 acres at 279 farmers' sites was achieved. Plantation on highest acres was achieved in Chakwal District on

which 1074 acres with 95 farmers was done whereas in Jhelum it was 588 acres with 47 farmers , in Attock at 716 acres with 60 farmers, in Rawalpindi on 428 acres with 45 farmers whereas in Khushab it was 154 acres involving 16 farmers. In district Mianwali, olive plantation was done on an area of 103 acres on 16 sites. The project help desk established at institute provided guidance to all interested farmers/visitors during the period.



Olive orchards at farmers' fields

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

During the year 2017-18, 213 plants of different high value fruit crops were

imported and planted in the High Value Fruit Block after acclimatization in the tunnels. Two varieties of Fig (Dela Reina and Breva) were added in the existing figs block. 50 plants of Avocado variety Hass, 50 plants of Nectarines, 50 plants of berries and 13 plants of grapes were planted in the block. Dragon fruit started bearing fruit this year. Three varieties of Fig have also started fruiting. Pistachio and Avocado is performing well regarding their vegetative growth under the climatic conditions of Chakwal. Nursery of Avocado was also established at the institute with 980 plants which were grown through see Data regarding growth parameters was collected.



Pistachio



Nectarine



Fig

Passion fruit



Avocado

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 *Brassica* crop var. Chakwal sarsoon was sown on 27-09-2017 at Bhera over an area of 2 acres. *Brassica* crop before commencement were covered with virus net on 06-11-2017 to check effective contribution of honeybees in pollination of *Brassica* at Bhera.. Data taken during flowering season comprised of 10 weeks.

Canola crop was found to be visited by 35 insect species belonging to five orders on *B. napus* during flowering season. Out of which twenty-seven species were frequent visitors of canola flowers. These foragers comprised six bees, two wasps, twelve flies, seven butterflies, two moths, three beetles and three bugs. Bees were among the most abundant floral visitors with total abundance of 89.79%, followed by Diptera (5.12%) and butterflies (3.24%). Moths and wasps were the rarest floral visitors with 18 and 2 individuals, respectively. From present studies, it is evident that *A. mellifera* were the most dominant pollinator of canola crop with the highest abundance (87.66%). This shows that *A. mellifera* is an efficient pollinator of this crop and farmers can get maximum benefit from their pollination services by allowing beekeepers to keep *A. mellifera* colonies near their fields.

During the blooming process of *B. napus* plants, 5073 insects were recorded on their flowers. They included species of Hymenoptera, especially *A. mellifera* (87.66%), Diptera, Lepidoptera and Coleoptera. The attractiveness of *B. napus*

flowers to *A. mellifera* is associated with the availability of food resources, whether nectar or pollen. The correlation between the number of *B. napus* flowers in the crop and the number of recorded honey bees during the blooming period was positive ($n = 8$ days; $r = 0.87$; $p < 0.05$).

Present results illustrated marked difference on yield parameters of canola plants having access to *A. mellifera* and other insect pollinators as compared to other treatments. Open pollinated (*A. mellifera* and other insect pollinators) canola plants had significantly higher yield than canola plants under different treatments. Means comparison of pods plant^{-1} expressed significant differences between plants exposed to spontaneous insects (302 ± 60.9). The performance of plants exposed by spontaneous pollinators was better (5213 ± 65.2) and they produced more seeds per plant as compared to other treatments. Means comparison indicated that seed weight per 100 pods obtained from spontaneous insects' pollinated plants (27.5 g) was significantly different from plants pollinated by other treatments.

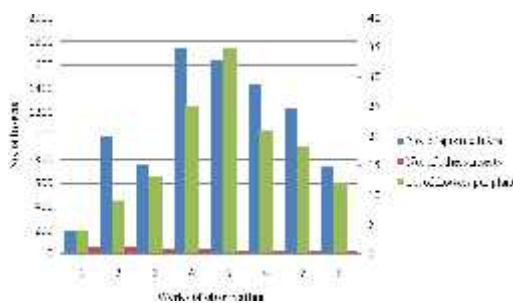


Figure 1: Frequency of insect occurrence according to *B. napus* blooming progression. Blue bars represent *A. mellifera*; Red bars represent other insects. Green bars represents blooming progression.





VEGETABLES

Different garlic varieties such as NARC-1, NARC-3, NARC-4, NARC-6, China, Gulabi lehsan, desi, Italian and G-14109 were grown. Among them, “China” produced maximum number of bulbs. Indeterminate tomatoes were grown in an open field conditions as an off-season crop and variety T₁-1359 F₁ gives the maximum fruit yield (15.89 T/ha). Different chillies lines and there crosses were planted in field and were evaluated on the basis of fruit yield related parameters. These lines and crosses will be used further for improvement of chilli germplasm. In nother research project, 10 frost tolerant potato genotypes were grown and their yield was recorded. In order to conserve moisture, in a soil, multi locational indeterminate hybrid tomatoes were grown in plastic tunnel with drip irrigation and mulching system and their growth characteristics and fruit yield were examined.



Growing of indeterminate tomatoes in a plastic tunnel with drip irrigation and mulch



Trail of frost tolerant tomato genotype



Unifrom yield trail of garlic

Sr.No	Traits	Min	Max
1	Plant height (cm)	40	125.9
2	Days to flower initiation	35	49
3	No. of Primary branches	5	13
4	No. of Secondary branches	6	17
5	Fruit length (cm)	3.6	5.3

6	Yield per plant(g)	293.1	1139.2
---	--------------------	-------	--------

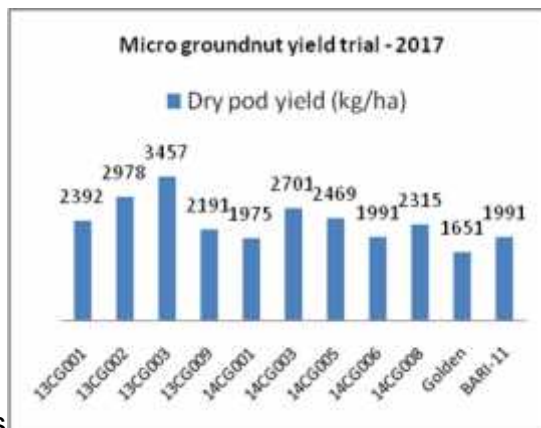
Range of various Chilli lines and crosses traits

GROUNDNUT

One hundred and eighty groundnut genotypes 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 four desirable varieties /advance lines and all crosses were successful. 160 progenies were selected from filial generations for further evaluation.

Nucleus seed of 20 kg BARI-2011, 50 kg of BARI-2016 was produced in 2017. Eight entries were evaluated against two check varieties in NUGYT sown at BARI, Chakwal, 10CG001 of this institute stood second for dry pod yield in NUGYT-2017 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 varieties BARI-2016 and Golden. Three lines performed better and gave more yield than the check variety. Highest yielder 13CG003 gave maximum grain yield of 3457Kg/ha whereas lowest yielder was 14CG006 with 1991 Kg/ha. Four groundnut advance lines along with three approved check varieties were tested for Cercospora leaf spot disease resistance. All test entries differed none significantly for disease at harvesting stage. Under artificial disease pressure 100 grain weight of BARI-16 and Golden influenced minimum as compared to rest of test genotypes. None of test genotypes proved



better than standard checks

HYBRIDIZATION IN GROUNDNUT



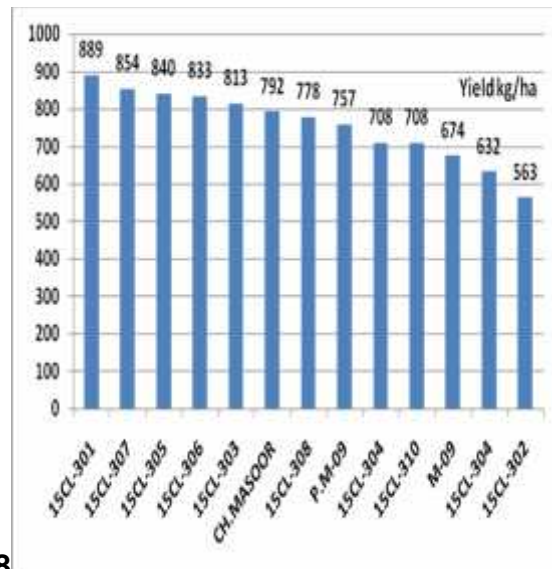
Crossing of Groundnut Elite Lines

LENTIL

Twelve new crosses of Lentil were attempted, all were successful and their seed was collected for further studies. Eighty seven crosses / progenies of F₁, F₂, F₃, F₄ and F₅ generations were studied. Out of these, One hundred & forty eight single plants / lines were selected further evaluation in in subsequent generations.

In micro yield trial, ten entries were evaluated against 3 check varieties. Five lines were selected due to their better yield performance as compared to check varieties.

Thirty lentil advance lines along with three standard checks were screened against root rot disease under sick field conditions. Minimum mortality was recorded in 14CL302.



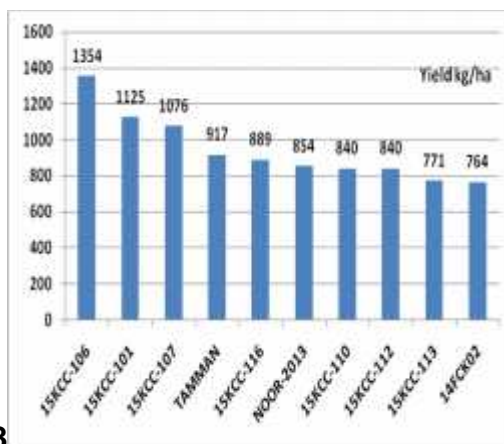
Lentil Micro Yield Trial 2017-18

CHICKPEA

Twelve new crosses of Chickpea were attempted, all were successful and their seed was collected for further studies. Twenty crosses / progenies of F₁, F₂, generations were studied. Out of these, Sixty eight single plants / lines were selected further evaluation in subsequent generations.

In micro yield trial, eight entries were evaluated against 2 check varieties. Three lines were selected due to their better yield performance as compared to check varieties.

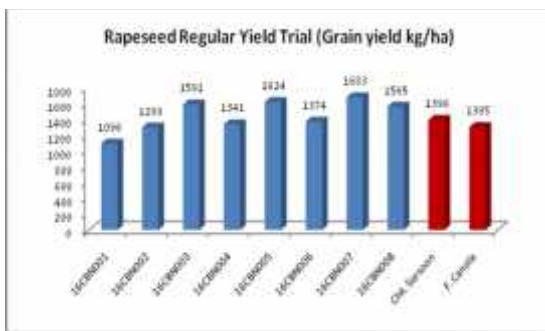
Thirty eight chickpea advance lines along with two standard checks were screened against root rot disease under sick field conditions. All genotypes exhibited none significant difference for germination under sick field conditions while minimum mortality was recorded in 15KCC116.



Chickpea Micro Yield Trial 2017-18

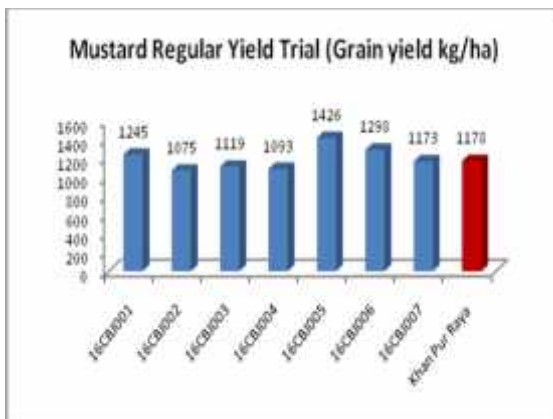
RAPESEED

In Rapeseed Regular yield trial 08 elite Rapeseed lines were studied and evaluated on the grain yield performance including the check varieties Chakwal Sarsoon and Faisal Canola. Four lines performed better and gave more yield than the check varieties. Highest yielder 16CBN007 gave maximum grain yield of 1683Kg/ha whereas lowest yielder was 16CBN001 with 1096 Kg/ha.



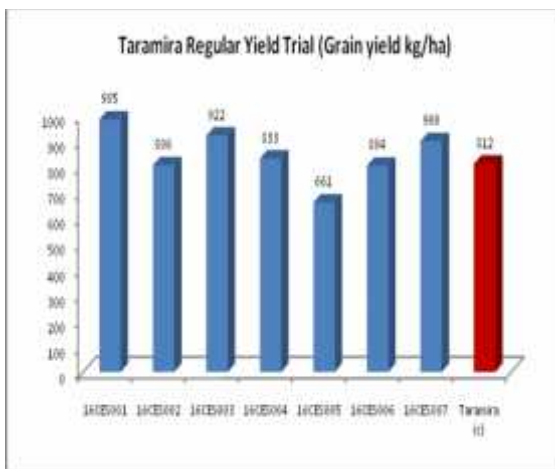
MUSTARD

Seven promising lines of Mustard were evaluated for their grain yield performance in Regular Yield trial against check variety Khan Pur Raya. Three lines performed better than the check variety under rainfed conditions. Elite line 16CBJ005 performed better and gave maximum grain yield of 1426Kg/ha, whereas lowest yielder 16CBJ002 gave the grain yield of 1075 Kg/ha.



TARAMIRA

In Taramira Regular yield trial, seven entries were evaluated against check variety. Four lines were selected due to their better yield performance. Maximum yielding elite line 16CES001 produced grain yield 985 Kg/ha whereas lowest yielder 16CES005 produced grain yield 661 Kg/ha.



WHEAT:

Regarding hybridization, two hundred and fifty targeted crosses were successfully threshed for further studies. Five hundred and eighty one crosses / progenies of F₁ to F₆ generations were evaluated in the field. Four hundred and fifty 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, a total of 869 entries were evaluated and 49 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, thirty three entries were tested for their grain yield performance under rainfed conditions and eleven entries were selected on the basis of higher yield and disease resistance.

In regular yield trial, fourteen entries were tested for their grain yield performance under rainfed conditions and four entries viz; 17C080, 17C086, 17C089 and 17C090 gave higher grain yield than the check varieties i.e. Ihsan-16, Chakwal-50 and Dharabi-11

In Punjab Uniform Wheat Yield Trial, fifty entries from different institutes of Punjab were evaluated. Yield performance of these lines at BARI, Chakwal is given below.

Yield Data (Kg / ha) of Punjab Uniform Wheat Yield Trial 2017-18

S. No.	Yield (Kg/Ha)	S. No.	Yield (Kg/Ha)
1	3078	26	3900
2	2789	27	3544

3	3178	28	3733
4	2944	29	3656
5	3333	30	3833
6	2500	31	3267
7	2833	32	2378
8	2544	33	3611
9	3078	34	3878
10	3922	35	3476
11	3778	36	3956
12	3956	37	4156
13	3889	38	4389
14	3289	39	4244
15	3967	40	4167
16	3922	41	4511
17	4278	42	5156
18	4091	43	4467
19	3300	44	4700
20	4478	45	3656
21	4633	46	4382
22	4658	47	4456
23	4889	48	3811
24	4144	49	3989
25	4760	50	4356

In National Uniform Wheat Yield Trial 2017-18, sixty advance wheat lines were sown at Barani Agricultural Research Institute Chakwal. The yield data recorded is given below:

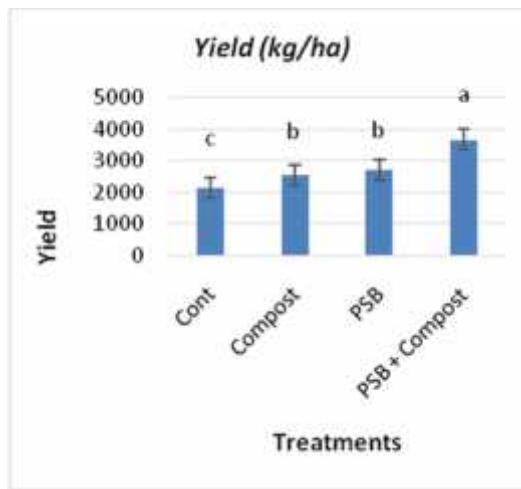
Yield Data (Kg/ha) of National Uniform Wheat Yield Trial 2017-18

V.Code	Average Yield/ha	V.Code	Average Yield Kg/ha
1	2866	31	2844
2	3088	32	2925
3	2296	33	3206
4	2407	34	3332
5	3095	35	3073
6	2636	36	3495
7	1562	37	3155
8	2836	38	2932

9	3140	39	3206
10	2888	40	3369
11	2599	41	2992
12	2133	42	3599
13	3777	43	2932
14	2829	44	3193
15	4221	45	3384
16	3703	46	2510
17	2858	47	3562
18	3073	48	2740
19	3177	49	3939
20	3340	50	2999
21	3177	51	3740
22	3384	52	2592
23	3066	53	3525
24	2932	54	3036
25	4102	55	3169
26	3562	56	2947
27	2392	57	2799
28	2955	58	3754
29	4332	59	4265
30	3814	60	3978
LSD (0.05)		= 335	
CV %		= 7.1	

Impact of compost and phosphorus bio fertilizer on wheat yield

A field experiment was conducted to the study effect of organic compost and phosphorus solubilizing bacteria (PSB) on the yield of wheat at BARI, Chakwal during 2017-18. The soil was low in organic matter (0.52%), available nitrogen (0.025%), phosphorus (6 mg/kg) and medium in available potassium (130 mg/kg). Application of organic compost and PSB markedly influence the yield of wheat.



MASH

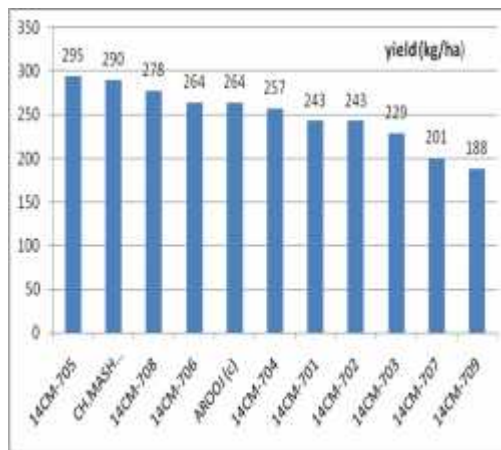
Ten crosses were attempted among the selected mash genotypes. All the crosses were successful and harvested for further studies in F₁ generation.

Eighty nine crosses / progenies of F₁, F₂, F₃, F₄, F₅ and F₆ generations were sown and studied. On field performance basis, 163 single plants / lines were selected for further evaluation in subsequent generations.

Nine promising lines of mash were evaluated for their yield performance in micro yield trial against two check varieties. One line performed better than best check variety (Chakwal Mash) under rainfed conditions.

Forty four advance lines along with three standard checks of approved varieties of mash were screened against yellow mosaic virus. Genotype 12CM708 proved tolerant to disease by giving maximum 100 grain weight (4.27g) with disease score of 4 under 0-5 disease scoring scale.

Mash micro yield trial 2017



OLIVE

The GPU was extended and the total number of olive varieties reached up to 70. During this year, 23 varieties gave fruit.

In the year under report, 12000 true to type olive plants of promising varieties and 411927 imported olive saplings were distributed among 279 progressive olive growers of the Pothowar region and plantation was done on an area of 3063 acres. Free of cost facility of olive oil extraction was provided to 40 olive growers. Olive oil extraction of 20796 kg fruit was done, while amount of oil extracted was 2247 lit.

GRAPES

The trend of grape production in Punjab is increasing day by day due to good per acre income from early varieties. In recent year, 1981 true to type grape plants of promising varieties were provided to the progressive growers of the region.

Current year Sultanina-C, Vitro Black and Superior Seedless varieties performed very well regarding fruit quality and yield. Sultanina C is getting popularity among the grapes growers due to its elongated shape and yellowish green color. This year 28 grape varieties bear fruit.. Multiplication blocks including 2997 plants of encouraging grapes varieties are established at the Institute to get maximum cuttings for nursery production.



Grapes Nursery



Sultanina C



Vitro Black

FIG

Fig is performing very well in the Pothowar region and requires less irrigation as compared to other fruit crops of the region. Three varieties of fig Kadota, Verte and Sarilop are bearing fruit during the current year. Data regarding fruit quality, fruit yield and vegetative growth will be taken. Two fig varieties were imported and planted at the Institute during this year along with the existing varieties. Dela Reina and Brevavarieties were imported and planted in the field.

CITRUS

In the current year Valencia Late, Morro, Salustiana, and Succari performed better than all other sweet orange varieties regarding fruit yield and quality. Kinnow is also performing well at the Institute.



Kinnow

PEACH & NECTARINE

Two exotic varieties of Nectarine (Carne Amarilla and Carne Blanca) and one variety of peach (Florida Prince) were added during the current year in the existing gene pool. Early Grand and Florida King are performing very well regarding fruit yield and quality as compared to all other peach varieties planted at the Institute.



NectarineN2-92

List of Publications

#	Title of Paper	Authors	Name of Journal	Issue/Page No.	Published/Accepted on (Date)
01	Screening OF Chickpea Kabuli (Cicer Arietinum L.) Germplasm against Ascochyta blight (Ascochyta rabiei)	M. Imran Khan, Waheed Arshad, Muhammad Zeeshan, Shiraz Ali, Ali Nawaz, Amina Batool, Muhammad Fayyaz	Journal Of Biodiversity and Environmental Sciences (JBES)	12(2) 128-132	28-02-2018
02	Breeding for Pre-Harvest Sprouting Resistance In Breed Wheat Under Rainfed Conditions	M. Imran Khan, Waheed Arshad, Muhammad Zeeshan, Shiraz Ali, Ali Nawaz, Amina Batool, Muhammad Tariq, Muhammad Imran Akram, Muhammad Amjad Ali	Frontiers of Agricultural Science & Engineering	Accepted	15-03-2018
03	Evaluating Green Manuring of Moringa and Jantar along with Inorganic Fertilizers to Enhance the Yield and Quality Attributes of	Muhammad Aqeel Sarwar, Muhammad Tahir, Abid Ali, Manzoor Hussain, Muhammad Waheed Anwar, Muhammad Khubaib Abuzar and Ijaz Ahmad	Pakistan Journal of Agricultural Research	30(4): 356-362	25-10-2017

	Autumn Maize (<i>Zea mays</i> L.)				
04	Performance Evaluation Of Sorghum Varieties In Pothwar Areas Of Pakistan.	Muhammad Imran Khan ¹ , Muhammad Zeeshan ¹ , Waheed Arshad ¹ , Shiraz Ali ¹ , Ali Nawaz, Aminabatool And Muhammad Tariq.	International Journal Of Advanced Research(Ijar)	6(1), 1202-1205	20-12-2017
05	Impact Of Sowing Techniques And Nitrogen Fertilization On Castor Bean Yield In Salt Affected Soils	M. Jamil, S. S. Hussain, M. Amjad Qureshi, S. M. Mehdi And M.Q. Nawaz	The Journal Of Animal & Plant Sciences,	451-456	27-2-2017
06	Rice Yield Improvement Through Various Direct Seeding Techniques On Moderately Salt Affected Soil	M. Jamil ¹ , S. S. Hussain ¹ , M. A. Qureshi, S. M. Mehdi, M.Q. Nawaz And Q. Javed	The Journal Of Animal & Plant Sciences	848-854	27-3-2017

06	Validation Of Fluorescence Spectroscopy To Detect Adulteration Of Edible Oil In Extra Virgin Olive Oil By Applying Chemometrics	Hina Ali1, Muhammad Saleem, Muhammad Ramzan Anser, Saranjam Khan1, Rahat Ullah1, Muhammad Bilal1	Applied Spectroscopy	1-15	11-2-2018
7	Weed and Wheat Dynamics Preceding Different Herbicides	Muhammad Asad, Safdar Ali, Muhammad Ramzan Ansar, Ijaz Ahmad, Muhammad Suhaib and Muhammad Khubaib Abuzar	Pakistan Journal of Agricultural Research	346-355	27-10-2017
08	Genetic Studies Of Biomass Partitioning In Wheat Underwater	N. Ahmad, A. S. Khan, M. Kashif and A. Rehman	The Journal of Animal & Plant Sciences	144-152	27-1-2017
09	Evaluation of potting media for rapid growth of mango nursery plants	I. Ul Haq,, A. Ghaffar, H. Umar and I.S.E. Bally	Acta Hortic.	133-138	17-10-2017

Meteorological Data for the year 2017-18

Month	Rainfall in mm	Temperature		Humidity %
		Minimum ⁰ C	Maximum ⁰ C	
July, 2017	238.9	24.0	34.0	73.6
August, 2017	164.1	24.0	34.4	73.6
September, 2017	25.3	20.5	34.4	63.2
October, 2017	1.2	15.9	33.1	54.0
November, 2017	16.4	8.1	24.1	77.0
December, 2017	17.5	3.5	20.6	81.5
January, 2018	1.0	0.9	19.8	65.1
February, 2018	18.5	5.1	21.4	63.9
March, 2018	39.3	11.4	1.8	61.7
April, 2018	82.8	15.8	30.7	53.0
May, 2018				