



**Barani Agricultural Research
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ANNUAL ABRIDGED REPORT FOR THE YEAR 2018-19

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. Seven research divisions are working under BARI 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, Mianwali and Hill Fruit Research Station, Sunny Bank, Murree are also working under this institute.

WHEAT (*Triticum aestivum* L.)

One hundred and sixty five wheat genotypes of diversified genetic background are under trial for their characterization. Some entries showed encouraging response towards yellow rust and further investigation regarding yield and yield components will be completed in due time. One hundred and eighty cross combinations were made among desirable parents to get the new recombinants. 296 filial generations are under study from F₁, F₂, F₃ and F₅.

Forty entries of wheat are at preliminary and regular yield testing stages while 600 are being tested in different screening nurseries

and 150 accessions are being screened in International Nursery. Two entries 17C089 and 17C090 were contributed in PUWYT and one entry 16C038 was sent for testing in NUWYT 2018-19. 17C089 and 16C038 showed resistance to yellow/stripe rust at the experimental area of this institute.

Nucleus seed production is primitive importance, plant rows; family blocks of Chakwal-50, Dharabi-11, Ihsan-16 and Barani-17 are being managed properly.

CURRENT RESEARCH PROJECTS

Wheat Productivity Enhancement Project (W-PEP)

Wheat Productivity Enhancement Project was launched to support wheat research activities especially rust surveillance in Pakistan by CIMMYT. The project has been closed up however, a minute amount of budget has been provided for wheat rust survey which was carried out by the scientists of this institute in districts Rawalpindi, Chakwal, Jhelum, Mianwali and Attock during March to monitor the occurrence of rust with the help of GPS tracker. During survey, fifty six 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), 100 wheat accessions have been collected from various national and international (CIMMYT, ICARDA) sources. These will be screened for Zn, Fe, K and Mg contents to select entries with higher Zn, Fe, K and Mg contents for balancing human diet. Zn uptake showed a wide range from 11.89 to 78.12 mg/kg while Fe uptake varied from 5.72 to 313.08 mg/kg. Fe and Zn have been applied @ 10 kg/ha and uptake response will be verified

Four sowing dates from 15st Oct. to 1st Dec. with 15 days interval are being tested one

genotypes 16C038, and a variety Ihsan-2016 of wheat crop. The data recording is under process, crop is still in field



Fig.1 Biofortification of Zn and Fe on wheat

During the year, olive plantation on 1006 acres at 106 farmers' sites was achieved. Plantation on maximum acreage was achieved in Chakwal District on which 486 acres with 50 farmers was completed whereas in Jhelum it was 193 acres with 12 farmers, in Attock at 149 acres with 20 farmers, in Rawalpindi on 62 acres with 9 farmers whereas in Khushab it was 40 acres involving 6 farmers. In district Mianwali, olive plantation was completed on an area of 77 acres on 9 sites. The project help desk established at institute provided guidance to all interested farmers/visitors during the period.





Olive orchards at farmers' fields

Impact of managed pollination by *Apis mellifera* L. on the yield of different crops, PARB Project No. 538

PARB project of three years duration 2016-19 was approved in 2016 for the impact of managed pollination by *Apis mellifera* L. on the yield of different crops. Total project cost was Rs. 14.413 million. During the current financial year 2018-19 *Brassica* crop var. Chakwal sarsoon was sown during October-November 2018 and four different locations in Chakwal over the area of more or less 1 acre were selected. In order to determine the density of the honeybee *Apis mellifera* for maximum crop pollination of *Brassica*, four treatments were designated for comparison i.e. 1 honeybee hive per acre, 2 honeybee hives per acre, 3 honeybee hives per acre and 0 honeybee hive per acre. The hives were kept alongside the experimental area marked in the study fields. The four parameters such as Pollinator Density, Pollinator Diversity, Agronomic Yield and Economic Yield will be recorded as per the protocol prescribed in the project's PC-1. Till to date (28th March, 2019) almost 10% flowering is remaining. The data recording of

all the parameters will be taken and statistically analyzed once the pod formation is completed.



Fig 1. Honeybee *Apis mellifera* visiting Canola flowers



Fig 2. Experimental Site of Canola at BARI, Chakwal

During survey sixty two samples of yellow rust (*Puccinia striiformis*) were collected and sent to Crop Diseases Research Institute Murree for race analysis.

Under the PARB project “Pre and Post-harvest management of aflatoxin contamination in groundnut (*Arachis hypogea*)” aflatoxin contamination was assessed by using REA GEN (AFB1) ELISA kit on BioTek ELx800 absorbance meter. A survey of groundnut growing areas of rainfed

region in Punjab was conducted, sixty two samples were collected and among these samples minimum aflatoxin contamination 0.739 ng/mL was recorded from District Attock. Rests of samples were with higher range of contamination.

In another experiment to assess the effect of soil amendments like cereal crop residue, farm yard manure and gypsum applied in single or in combination before sowing or 50 days after planting at two locations of Chakwal and Attock. All treatments remained at par however aflatoxin contamination was less at Attock than at Chakwal.

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

Pistachio, Nectarine and Peaches performed well regarding their vegetative growth under the climatic conditions of Chakwal. Three varieties of Peach and two varieties of Nectarine are bearing fruit this year. Vegetative growth of Fig plants is very good. Three varieties of Fig have also started fruiting.



Nectarine carneAmarilla

VEGETABLES

Different germplasm of peas (110 entries), garlic (12 entries) and potato (32 entries) were collected, maintained and characterized from diversified genetic background with a view to develop new recombinants through crossing among strains/lines possessing desirable economic characters. In another experiment, different gametocides such as GA₃ and detergent were used to induced pollen sterility in garlic and onion and to reduce the time and cost involve in manual emasculation. In order to reduce the cost involve in chilli hybrid seed production, CMS line in chilli will be identified through different morphological (plant height, pollen color) and physiological parameter (pollen viability test) for cost effective hybrid seed production.



Different peas germplasm at BARI, Chakwal



Trail of frost tolerant potato genotypes



different collected potato germplasm



Garlic germplasm at BARI, CHAKWAL

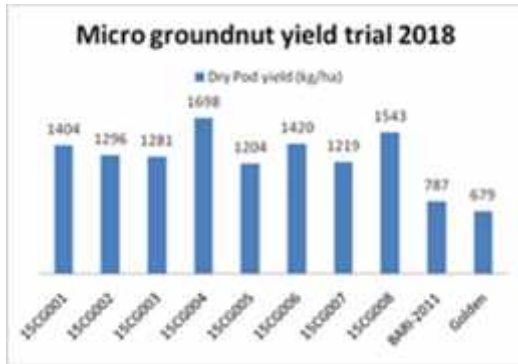
GROUNDNUT (*Arachis hypogaea*)

One hundred and ninety 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. 150 progenies were selected from filial generations for further evaluation.

Nucleus seed of 150 kg BARI-2011, 160 kg of BARI-2016 was produced in 2018. Seven entries were evaluated against two check varieties in NUGYT sown at BARI, Chakwal, 13CG003 of this institute showed more dry pod yield (kg/ha) than both check in NUGYT-2018.

In groundnut micro yield trial 10 elite groundnut lines were studied and evaluated on the basis of grain yield performance including the check varieties BARI-2011 and Golden. Highest yielder 15CG004 gave maximum

grain yield of 1698Kg/ha whereas lowest yielder was 15CG005 with 1204 Kg/ha.



Dry pod yield of advanced lines(kg/ha)

HYBRIDIZATION IN GROUNDNUT



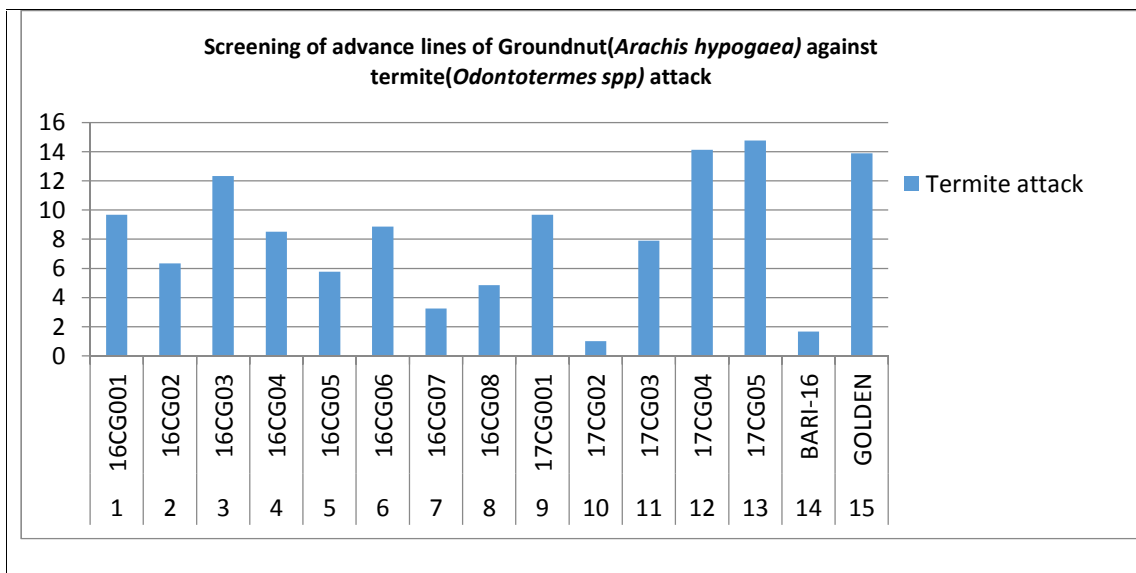
Crossing of Groundnut Elite Lines

The Promising line 13CG003 and variety Bari-2016 were tested against six sowing dates. The Groundnut crop sown on 20th Mar2018 gave highest pod yield of 1944.4 kg/ha. The lowest pod yield of 854.5 kg/ha was observed when Groundnut crop sown on 10th June 2018. The Groundnut variety Bari

2016 gave highest pod yield of 1539.00 kg/ha followed by Groundnut promising line **13CG003** producing the pod yield of 1274.00 kg/ha.

The three Hydrogel doses (30gm/m², 40gm/m² and 50gm/m²) and three sowing methods (side dressing, broadcasting and drill sowing) were tested for Groundnut variety bari-2016. The Groundnut crop sown by applying the hydrogel doses of 50 g/m² gave highest mean pod yield of 1408.0 kg/ha. The lowest pod yield of 1257.0 kg/ha was observed when 30 g/m² Hydrogel dose was used. Side dressing Method of application gave highest mean pod yield of 1448.0 kg/ha followed by Drill Application method by producing 1284.0 kg/ha.

Thirteen advance lines and 2 check varieties (BARI-16 & Golden) of groundnut were tested against termite (*Odontotermes spp*) attack during Kharif-2018. 17CG02 proved to be the most resistant line followed by 16CG07 and the most susceptible line was 17CG05. The overall response of the thirteen advance lines and the 2 checks is depicted as follows:



Five sowing dates from 15th September to 15th November at 15 days interval are being tested against three genotypes 14CL304, 14CL305 and CHAKWAL Masoor of lentil crop. The data recording is under process, crop is in field.

LENTIL (*Lens culinaris L*)

Twelve new cross combinations among desirable parents of Lentil were attempted and it is hoped that good new recombinants will be harvested. One hundred and twenty nine segregating populations are at different levels from F₁, F₂, F₃, F₄, F₅ and F₆. It is expected that good recombinant and desirable plants from segregating generations will be selected for further evaluation in the next generation. Thirty five promising entries of lentil are at different level of testing from preliminary yield trial and micro yield trial. Two entries of lentil namely 14 CL304 and 14CL305

were contributed in Lentil National Uniform Yield Trial 2018-19 and expected to give a good results.

Nucleus seed production in lentil is also being managed by planting family rows and family blocks of Chakwal Masoor.



CHICKPEA K (*Cicer arietinum L*)

Two hundred twenty two gram genotypes of diversified genetic background are under trial for their characterization. Most of the entries showed encouraging response towards blight and further

investigation regarding yield and yield components will be completed in due time. Twelve cross combinations were made among desirable parents to get the new recombinants. 72 filial generations are under study from F₁, F₂, and F₃

Thirty seven entries of Kabuli Chick pea are at preliminary, regular and micro yield testing stages while 60 are being tested in different screening nurseries. One entry 15KCC106 was contributed in NUYT. 15KCC106 showed resistance to Ascochyta blight at the experimental area of this institute.

Nucleus seed production is primitive importance, plant rows; family blocks of Tamman are being managed properly.



RAPSEED (*Brassica napus* L.)

In Rapeseed Preliminary yield trial 10 elite Rapeseed lines and in Rapeseed Regular yield trial 10 elite Rapeseed lines are under study and evaluation on the basis of grain yield performance including the check varieties Chakwal Sarsoon and Faisal Canola

is under progress. The Rapeseed crop is near to harvest. It will take two months to harvest

the crop and analyze the data to select top yielding lines.

Six sowing dates from 1th September to 15th November at 15 days interval are being tested against two genotypes 11CBN006, 14CBN009 and a variety CHAKWAL-Sarsoon of Brassica. The data recording is under process, crop is still in the field.

MUSTARD (*Brassica juncea*)

In mustard Preliminary yield trial 07 elite mustard lines and in mustard Regular yield trial 07 elite mustard lines are under study and evaluation on the basis of grain yield performance including the check variety Khanpur-Raya is under progress. The mustard crop is near to harvest. It will take two months to harvest the crop and analyze the data to select top yielding lines.

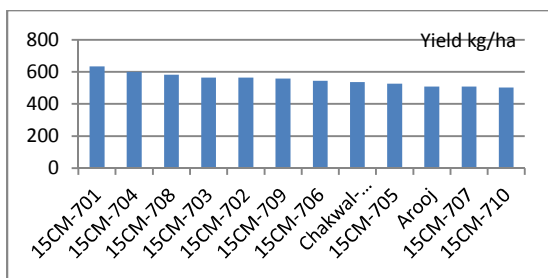
TARAMIRA (*Eruca sativa* L.)

In taramira Preliminary yield trial 07 elite taramira lines and in taramira Regular yield evaluation on the basis of grain yield performance including the check variety taramira is under progress.

The taramira crop is near to harvest. It will take two months to harvest the crop and analyze the data to select top yielding lines.

MASH (*Vigna mungo* L)

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, 78 single plants / lines were selected for further evaluation in subsequent generations. Twelve promising lines of mash were evaluated for their yield performance in micro yield trial against three check varieties. Seven lines performed better than the check varieties under rainfed conditions. Four sowing dates from 15st Jun. to 10st August with 20 days interval were tested against one genotypes 10CM707, and a variety CHAKWAL mash of mash crop. Mash crop sown on 10th June 2018 gave highest seed yield of 502.00.00 kg ha⁻¹ as compared to all other sowing dates. The lowest seed yield of 424.00 kg ha⁻¹ was observed when mash crop was sown on 10st August 2018.



OLIVE (*Olea Europae L.*)

The GPU has reached to up to a number of 70 out of which 23 varieties gave fruit.

In the year under report, 32653 true to type olive plants of promising varieties and 215040 imported olive saplings were distributed among 161 progressive olive growers of the Pothowar region and plantation was done on an area of 1598 acres. Free of cost facility of olive oil extraction was provided to 54 olive growers. Olive oil extraction of 17748 kg fruit was done, while amount of oil extracted was 1163 lit.

GRAPES (*Vitis vinifera*)

In the year under report, 12200 true to type grape nursery plants of promising varieties were provided to the farmers of the Punjab. 31500 grapes cuttings were planted in the nursery to prepare plants for the coming plantation season.

Superior Seedless, Early White, Sultanina-C, Vitro Black, Muscat Hambourg and Danlas varieties performed very well regarding fruit quality and yield. Superior Seedless, Sultanina C and Vitro Black are getting popularity among the grapes growers due to good market rates of these varieties.



Superior Seedless



Early White



Sultanina C



Muscat Hambourg

Date Palm (*Phoenix dactylifera*)

Germplasm Unit of Date Palm was established at the Institute with 15 varieties including 3 exotic varieties (Ajwa, Amber, Khalas). Halawi and Makran varieties performed well regarding fruit quality and

yield.



Date Palm Germplasm Unit

CITRUS

Valencia Late and Sweet Lime are performing well regarding their fruit quality and yield. Valencia Late ripens late in the season when other citrus fruit is not available in the market due to which it gets maximum rate in the market. Morro, Salustiana and Succari also performed better than other sweet orange varieties regarding fruit yield and quality.



Valencia Late

PEACH & NECTARINE (*Prunus persica*)

Nectarine varieties UFO-2 and UFO-4 performed better regarding fruit yield and quality of fruit. These two varieties were imported from Italy. Early Grand and

Florida King performed well as compared to all other peach varieties planted at the Institute.



Early Grand

Engineering Wing

Experiment 1: Application of Hydrogel through Bare Root Dipping method on chilies plants to check effect on soil moisture and growth of plants. Two treatments T1= Hydrogel treated, T2= Control with 04 replications. Mean weight of chilies per plant in T1 438 g and in T2 347 g with average yield in T1 9700 kg/ha and in T2 8350 kg/ha. Total irrigation applied in T1 was 150 mm and in T2 was 550 mm and 40% irrigation water was saved in hydrogel. Results are depicted in Figure 1 and 2.

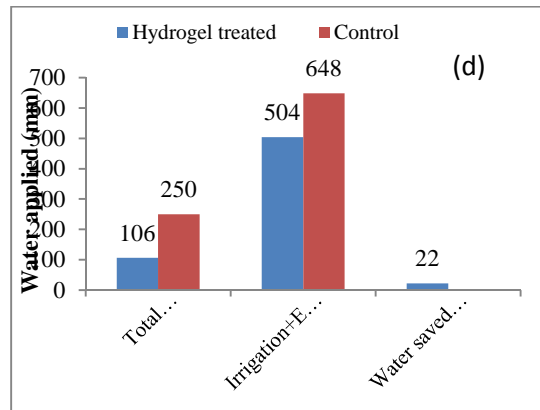
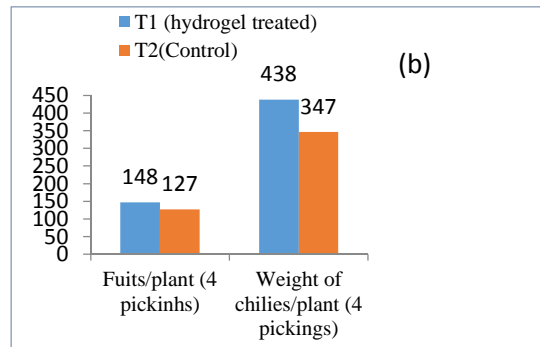
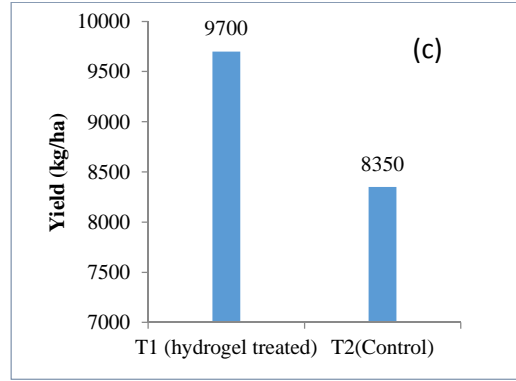
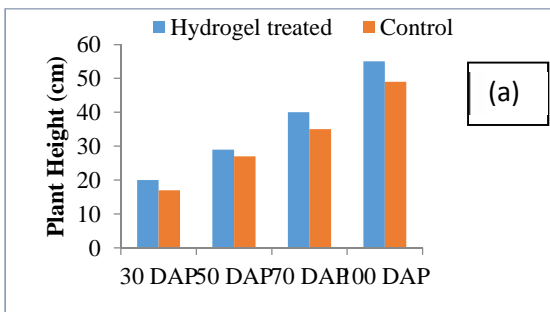


Figure 1: Crop data of chilies treated with hydrogel and in control condition (a) Plant height (cm), (b) Fruit/plant and weight of chilies, (c) Yield (kg/ha) of chilies, (d) Water applied (mm) and water savings.

Experiment 2: Effect of Hydrogel on soil moisture and growth of olive plants.

05 treatments T1= 25g hydrogel, T2 = 50g hydrogel, T3 = 75 g hydrogel, T4 = 100 g hydrogel and T5 = control. The highest amount of water was saved in

100 g T4 treatment but the growth parameters were gave highest results for T3= 75 g hydrogel treatment. Results are showed in Figure 2.

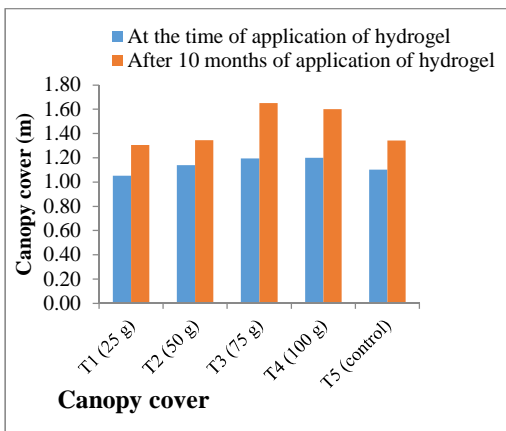
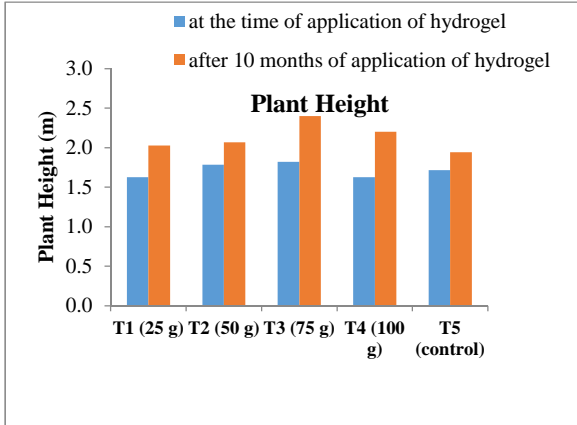
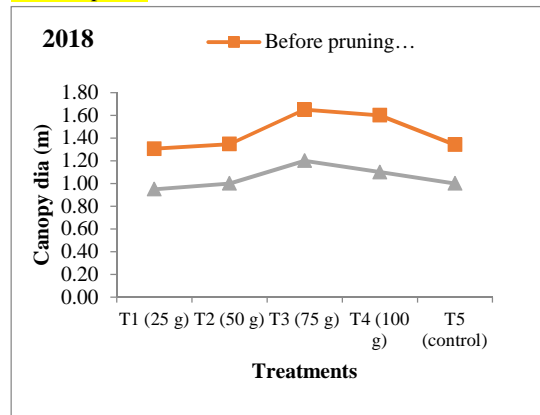


Figure 2: Crop data of hydrogel application on olive plants and its comparison with control.

Figure 3 is showing the trend of canopy cover before and after pruning in olive plants.

Figure 3: Trend in canopy cover before and after pruning of olive plants



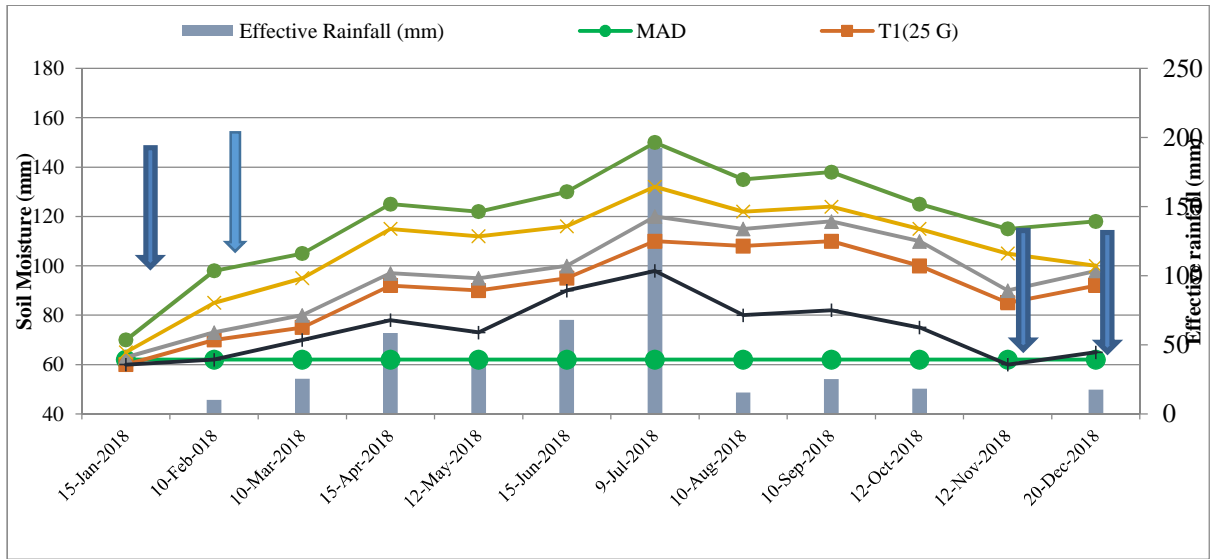


Figure 4: soil moisture distribution in hydrogel treated and control treatment

Experiment 3: Effect of hydrogel granules on the wheat productivity by maintaining soil moisture at root zone depth. The main objective is To analyze the status of soil moisture status and the effect of hydrogel dozes on the growth parameters and yield of wheat. Three treatments T1 = hydrogel application @ 35 kg/ha, T2 = hydrogel application @ 65 kg/ha, T3 = Control with three replications. Ahsan 17 variety was selected for the treatment.



Figure 5:Wheat under hydrogel treated and control plots

Experiment 3: Effect of hydrogel granules on the wheat productivity by maintaining soil moisture at root zone depth. The main objective is to analyze the status of soil moisture status and the effect of hydrogel doses on the growth parameters and yield of wheat. Three

treatments T1 = hydrogel application @ 35 kg/ha, T2 = hydrogel application @ 65 kg/ha, T3 = Control with three replications. Ahsan 17 variety was selected for the treatment.

Seed Production

S. No.	Name of Crop	Seed Produced (kg)
1	Groundnut	1600
2	Mungbean	400
3	Mash	60

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3. Ahmad, I. F. Bibi*, A. Bakhsh, **H. Ullah**, S. Danish and Asif-ur-Rehman. 2018. Assessment of various levels of potassium citrate and Sucrose along with boric acid on quality and yield of Sufaid Chaunsa. *Intern. J. Biosci.* 13(1): 188-195.
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6. **Attiq Akhtar**, Allah Bakhsh, Muhammad Ashraf Sumrah. 2018. Standardization of Optimum Budding Time for Peach Nursery under Soan Valley Conditions *J. Agri. Res.* 56 (4): 243-246.
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9. Irshad, M., Z. Parveen, A. Ghaffar, N. Hussain, M. Abbas, **M. Aslam** and K. Hussain. 2018. Fakhare-Bhakkar- A high yielding, temperature stress tolerant and rust resistant spring bread wheat variety. *International Journal of Advance Research in Biological Sciences*. 5(8):36-45. (**Impact factor: 0.654**).

10. Muhammad Aamir., Ejaz Ahmad Khan; Mohammad Safdar Baloch; **Muhammad Aslam**. 2018. Estimation of economic threshold for *Lathyrus aphaca* L. in wheat. International Journal of Biosciences (IJB). 13,(5):358-370. (**Impact factor: 0.553**).
11. S. Kiran, J. Iqbal, A. Bakhsh, H. Asif-ur-Rehman, **H. Ullah**, I. Ahmad, F. Bibi, S. Raza, A. Iqbal, S.I.U.S. Bukhari, S. Danish. 2018. Effect of grafting season, rootstocks and seedling age on success of stone grafting and pigments synthesis in Sindhri leaves. J. Biodiversity & Environ. Sci. 13(3): 63-72.
12. M.T. Malik, T. Tariq, A.H. Khan, **H. Ullah**, M. Imran, J. Iqbal, A. Zainab. 2018. Outbreak of Anthracnose and Stem End Rot Disease of Mango in Changing Climate and their Management through Hot Water Treatment. Pak. J. Phytopatho., 30(1): 91-98.
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Urdu Articles	: 3
Radio Talk	: 2
National /International Training/ Workshop	: 13
Participation in National and International Conference	: 1 (19-20 February, 2019)

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