

ANNUAL REPORT
(2021-22)



FODDER RESEARCH INSTITUTE
SARGODHA

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ANNUAL REPORT 2021-22

INTRODUCTION:

Pakistan's economy is mainly agriculture oriented contributing 19.2% of GDP. Livestock is vital sub-sector of Agriculture in Pakistan, accounts 11.53% to overall GDP which is 60.07% of the Agriculture's share to GDP (Economic Survey of Pakistan, 2020-21) and it provides milk, meat and other by-products of animal origin for human nutrition. Pakistan occupies 4th position in milk production in the world and produces 63684 thousand tons of milk per year. The value of milk alone is more than the combined value of two major crops i.e wheat and cotton. Fodder is backbone of the livestock and provides 2 to 3 times cheaper feed than concentrate to livestock. Fodder crops have unique position in context of livestock in our country where more than 8 million rural families of our population is directly involved in livestock production as a primary source of food and income. In Pakistan, total animal population comprising of cattle, buffalo, goat, sheep and camels is 206.9 million (Economic Survey of Pakistan, 2020-21). In Punjab province, during Kharif 2021 fodder crops occupied an area of 5220 thousand acres with total fodder production of 76364.6 thousand tons while in Rabi 2020-21 occupied an area of 3786 thousand acres with total fodder production 93913 thousand tons (Crop Reporting Punjab 2020-21 & 2021-22). In Punjab, fodder crops occupying third place after wheat and cotton with average fodder yield of 22.5 t/ha. Major Kharif fodder crops are maize, pearl millet and sorghum while major rabi fodder crops are berseem, alfalfa and Oats.

In order to narrow the gap between the demand and supply, there is a dire need of development for high yielding, highly nutritive, multicut varieties / hybrids of different fodder crops, standardization of their production and protection technology along with seed production of fodder varieties / hybrids. During 2021-22 four fodder varieties i.e. Faisalabad Sorghum (multicut), Punjab Jantar, Barkat Oats and Faisalabad Oats have been approved by the Provincial Seed Council for general cultivation. Moreover, spot examination of 3 lines of Guar, 2 lines of sorghum, 2 lines of Napier grass, 1 line of oats and 1 line of berseem have been completed and will be presented in upcoming expert sub-committee.

FODDER RESEARCH INSTITUTE, SARGODHA

SORGHUM BREEDING TRIALS

Maintenance of gemplasm of sorghum.

The breeding material comprising 610 varieties/lines (local & exotic) was maintained by selfing. These lines were studied for plant height, number of leaves per plant, leaf area, stem thickness days to 50% heading and sweetness.. Seed of 10-15 heads of each entry was kept for further studies in next year

Hybridization and filial generation.

With the help of polythene bag technique and manual emasculation about 40 crosses were attempted among the elite lines during the year 2021 but 35 crosses remained successful. Seed of each cross was threshed separately and preserve to observed the hybrid vigor in the next year F1 generation. The detail of filial generation studied during the year is given below:

Filial Generations	Entries Studied	Selected Progenies/Plants	Uniform Lines Selected
F1	40 crosses	35	-
F2	15 crosses	37Plants of 17 crosses	-
F3	30 Plants Progenies of 20 crosses	39 Plants of 20 crosses	-
F4	32 Plants Progenies of 32 crosses	35 Plants of 20 crosses	-
F5	35 Plants Progenies of 20 crosses	224 Plants of 15 crosses	
F6	25 Plants Progenies of 5 crosses	-	3

Preliminary fodder yield trial of Sorghum

During Kharif 2021, the trial comprising of fourteen promising lines/ varieties was laid out in RCB design with 3 replications having 1.8mx5m plot size to find out the best lines on the basis of green fodder yield. The crop was harvested at 50% heading. Green fodder yield data were recorded and are tabulated below (Table-1).

Table-1 **Green Fodder Yield**

<u>S. No.</u>	<u>Lines/Varieties</u>	<u>GFY (t/ha)</u>
1	I-9	74.00
2	FHS 1405	70.67

3	FHS 1401	61.33
4	Ausaf (Ckeck)	61.33
5	I-6	60.67
6	Pak Sorghum(check)	60.67
7	JS-2007	60.67
8	YSS-13	60.67
9	ABR (SG-1)	60.00
10	F HS 1402	59.67
11	F HS 1407	56.67
12	JABBLI	54.33
13	I-7	51.67
14	ABR(MS)	49.33
	LSD 0.05	06.23
	C.V %	18.00

On the perusal of Table-1, it was depicted that line I-09 gave significantly high green fodder yield (70 t/ha.) than the check variety “Aousaf sorghum” (61.33 t/ha).

Advanced Green Fodder Yield Trial Of Sorghum

Eight lines/ varieties were tested for their green fodder yield potential. The trial was laid out in RCBD with 3 replications having a plot size of 1.8x5m with 30cm apart rows. The crop was harvested at 50% heading. Green fodder yield data were recorded below (Table-2).

Table-2 **GREEN FODDER YIELD (t/ha.)**

Sr No.	Lines/Varieties	GFY (t/ha)
1	F-01-2019	66.67
2	FRI-02	62.67
3	FRI-07	60.00
4	No -66001	59.00
5	Pak Sorghum(check)	58.67
6	Ausaf (Ckeck)	55.67
7	F-01-2020	55.33
8	BALO	46.33
	LSD 0.05	06.54

The results persuaded that the line F-01-19 produced high green fodder yield (66.67 t/ha.) as compared to check variety “Aousaf sorghum” (55.67 t/ha).

Zonal Green Fodder Yield Trial Of Sorghum

Eight lines/ varieties were tested for their green fodder yield potential. The trial was laid out in RCBD with 3 replications having a plot size of 1.8x5m with 30cm apart rows. The crop was harvested at 50% heading. Green fodder yield data were recorded and are given below:-

Table-3 **GREEN FODDER YIELD (t/ha.)**

Sr. No	Variety/ line	FRI. Sgd.	FRSS, F/Abad	ESPU Farooqabad	ARS. B/pur	AVG (t/ha)
1.	No - 74702	60.67	76.32	59.17	46.34	60.625
2.	F - 01- 19	57	78.36	60.44	32.51	57.0775
3.	No - 9802	53.33	81.24	54.77	34.01	55.8375
4.	No - 6197	48	81.05	57.91	33.64	55.15
5.	Pak Sorghum (check)	51	80.52	50.33	34.76	54.1525
6.	F – 01 - 20	47.67	81.36	52.88	31.77	53.42
7.	Aousaf (check)	53.67	71.5	51.69	32.52	52.345
8.	F – 02 - 20	46	65.63	50.35	41.11	50.7725

The results showed that the line No - 74702 (Fig-1) produced higher green fodder yield (60.63 t/ha) against the check “Aousaf sorghum” (52.35 t/ha).

PEARL MILLET BREEDING TRIALS

Collection and maintenance of germplasm.

100 genotypes were planted in paired rows isolated by sorghum. Material was well managed through timely field operations. The selected heads of variety/ line were bagged and tagged. The seed of these heads was collected and stored for further studies.

Hybridization & Selection Of Pearl Millet

08 crosses were attempted to create the genetic variability through hand emasculation. Detail of crosses is given below.

Purpose	Number of crosses
Multicut	4
Dual Purpose (Grain/Fodder)	4
Total	08

All the crosses were attempted but only 02 were successful.

Preliminary green fodder yield trial Of Pearl Millet.

The experiment consisting of 10 lines/varieties was sown in order to pin point the highest green fodder yielding line of millet. The trial was laid out in RCBD with 3 replications having a plot size of 1.8x6m in 30cm apart rows. The crop was harvested at 50 % heading. Green fodder yield data were recorded and are given below:-

Table 4: **GREEN FODDER YIELD**

S.No.	Varieties / Lines	Green Fodder Yield (t/ha.)
1	SEL. 8795	71.45
2	SEL.8796	66.79
3	COMPOSITE-III	63.48
4	EXBD BULK	61.64
5	YBS-5	57.96
6	D-POP	57.32
7	SEN POP	56.12
8	NO.8873	56.12
9	NO.8856	53.91
10	SGD.BAJRA 2011(Check)	52.71
	LSD (5%)	4.19

The results revealed that the line SEL. 8795 was the top performer among all the tested entries by producing 71.45 t/ha green fodder yield while the check variety Sgd.Bajra.2011 produced 52.71 t/ha.

Advanced Green Fodder Yield Trial Of Pearl Millet.

The trial consisting of 8 promising line/ varieties was laid out in RCBD with 3 replications having a plot size of 1.8x6m in 30cm apart rows. The crop was harvested at 50% heading. Green fodder yield data were recorded and is given below:-

Table-5:

GREEN FODDER YIELD

<u>S.no.</u>	<u>Varieties / lines</u>	<u>Green fodder yield (t/ha)</u>
1	NO.8860	69.55
2	YBS-92	66.79
3	YBS-93	62.56
4	FB-195	62.19
5	NO.8861	59.43
6	YBS-94	58.88
7	KING BAJRA	58.24
8	SGD-BAJRA 2011(Check)	52.71
	LSD (5%)	4.63

The results clearly showed that the line 'No.8860' remained high yielder by producing maximum green fodder yield of 69.55 t/ha as compared to check variety Sgd. Bajra 2011 (52.71 t/ha).

Zonal Green Fodder Yield Trial Of Pearl Millet

Trial consisting of 08 lines/varieties was conducted at four different location of Punjab to test the stability and green fodder yield of millet. Average data of all locations is given below

Table-6

Green Fodder Yield

<u>Sr. No</u>	<u>LINES/VARIETIES</u>	<u>Green Fodder Yield (t/ha)</u>				
		<u>FRI, Sgd.</u>	<u>FRSS, F/Abad</u>	<u>ARS, B/pur.</u>	<u>ESPU, Fq.Abad</u>	<u>Average</u>
1	RAJ	69.55	62.13	61.67	50.29	60.91
2	W-RAJ	69.55	55.3	62.41	55.38	60.66
3	Y-84	71.11	59.3	56.06	49.37	58.96
4	S-2017	70.19	58.49	53.82	46.91	57.35
5	WATNI	63.48	52.48	61.29	51.25	57.13
6	COMPOSITE-5	64.03	57.65	48.21	49.72	54.90
7	SGD-BAJRA 2011 (Check)	50.06	71.62	49.33	45.8	54.20
8	RCBK-948	62.55	49.71	51.95	49.08	53.32
	LSD (5%)	5.47	N.S	4.36	8.12	

The results showed that the line 'Raj' (Fig-2) significantly out yielded the check variety Sgd. Bajra 2011 by producing on an average 60.91 t/ha green fodder yield at all the locations.

MAIZE

Maintenance And Seed Production Of Maize Germplasm

Breeding material consisting of 56 lines was sown in 60cm apart rows of 14 meter length. The genotypes were properly maintained through timely bagging and rouging off type plants. Seed of these genotypes was collected for further studies.

Development Of Composite Variety Of Maize

Equal quantity of 5 different lines were mixed and allowed random mating through open pollination. Seed of C₁ and C₂ generations were collected for further study and selection process.

Preliminary Fodder Yield Trial Of Maize

The trial consisting of 10 promising lines/ varieties was laid out in RCBD with 3 replications having a plot size of 1.8x5m with 30cm apart rows. The crop was harvested at 50% heading. Green fodder yield data were recorded and is given below:-

Table-7 **Green Fodder Yield**

Sr. No.	Varieties/ Lines	Green Fodder Yield (t/ha)
1	MS-07-2021	60.73
2	MS-01-2021	52.59
3	MS-02-2021	51.48
4	MS-03-2021	50.37
5	MS-08-2021	48.88
6	MS-05-2021	47.40
7	Super Green Maize (Check)	44.44
8	MS-06-2021	44.07
9	Sgd.2002 (Check)	43.70
10	MS-04-2021	42.97
	LSD (5%)	7.23

The results showed that the line MS-07-2021 gave maximum green fodder yield (60.73 t/ha) followed by MS-01-2021 (52.59 t/ha) as compared to check variety Super Green Maize (44.44 t/ha).

Advanced Fodder Yield Trial Of Maize

Eight promising lines/ varieties were tested for their green fodder yield potential. The trial was laid out in RCBD with 3 replications having a plot size of 1.8x5m with 30cm apart rows. The crop was harvested at 50% heading. Green fodder yield data were recorded below

Table-8 **Green Fodder Yield**

Sr. No.	Varieties/ Lines	Green Fodder Yield (t/ha)
1	MS-07-2020	54.44
2	FM-01-2020	48.14
3	MS-01-2020	42.22
4	MS-02-2020	41.11
5	FM-02-2020	41.11
6	Super Green Maize (Check)	37.40
7	Sgd.2002 (Check)	35.18
8	MS-08-2020	33.70
LSD (5%)		6.78

The results persuaded that the line MS-07-2020 gave significantly high green fodder yield (54.44 t/ha) as compared to check variety Super Green Maize (37.40 t/ha).

Adaptability Green Fodder Yield Trial Of Maize

Seven advance lines /varieties were tested at four different locations of Punjab province for their green fodder yield and adaptability. The average data of green fodder yield is given below.

Table-9 **GREEN FODDER YIELD**

Sr. No.	Lines / Varieties	FRI, Sargodha	FRSS, F/Abad	ARS, B/Pur	ESPU, Farooqabad	Average (t/ha.)
1	MS-03-2019	52.22	64.52	30.65	58.33	51.43
2	MS-05-2019	55.92	68.31	26.91	29.62	45.19
3	MS-08-2019	46.66	52.45	22.42	45.37	41.73
4	MS-02-2019	42.59	49.71	20.93	51.85	41.27
5	Sgd.2002 (Check)	37.03	65.49	28.03	32.4	40.74
6	Composite-II	43.69	58.1	21.67	38.88	40.59

7	Super Green Maize (Check)	44.81	62.65	26.91	25.92	40.07
	LSD (5%)	11.80	5.70	4.13	-	

Results depicted that the line MS-03-2019 produced significantly higher green fodder yield (51.43 t/ha) as compared to check variety Super Green Maize (40.07 t/ha).

S.S. HYBRID

Maintenance And Seed Production Of ‘A’, ‘B’ lines Of Sorghum And R Lines Of Sudan Grass

‘A’ & ‘B’ lines of sorghum and R lines of Sudan Grass were planted for maintenance. One row of ‘B’ line (male) was sown on either side of two rows of ‘A’ line (female). Male fertile plants were rogued out from ‘A’ line to ensure its purity. Seed was preserved for further studies.

National Uniform Fodder Yield Trial Of SS Hybrid

A trial consisting of 53 coded lines received from National Coordinator (Fodder), NARC, Islamabad was laid out with the objective to find out a variety/ line with higher green fodder yield potential. Methodology was adopted according to the plan proposed by the National Coordinator (Fodder), NARC, Islamabad.

COWPEAS BREEDING TRIALS

Maintenance Of Germplasm

34 genotypes were sown in 120 cm apart rows for their maintenance. The trial was well managed through timely cultural operations. Off-type plants were rogued out for purity maintenance. Different morphological characters were recorded. The seed was preserved for further use in breeding programme.

Preliminary Fodder Yield Trial Of Cowpeas

The trial was planned to evaluate yield potential of 12 cowpeas lines/ varieties for testing their green fodder yield potential. The experiment was laid out in RCBD with 3 replications having a plot size of 3x6m. The green fodder yield data are given in the table.

Table-10

Green Fodder Yield

S. No	Lines/varieties	Green fodder yield (t/ha)
1	CP-115	42.34
2	CP-386	40.32
3	CP-96	40.25
4	CP-95	39.24
5	SS92-1	38.10

6	CP-181	37.92
7	ST99K360	37.55
8	CP-271	36.63
9	Rawan-2003 (check)	35.90
10	No.32	35.88
11	SS-92-2	35.14
12	No.1	30.15
	LSD 0.05	4.50

Results showed that the line CP-115 gave higher green fodder yield (42.34 t/ha) followed by CP-386 (40.32t/ha) as compared to check variety Rawan 2003 (35.90 t/ha).

Advance Green Fodder Yield Trial Of Cowpeas

Nine lines/ varieties were tested for their green fodder yield potential. The trial was laid out in RCBD with 3 replications having a plot size of 3mx6m in 60cm apart rows. The crop was harvested at 50% heading. Green fodder yield data were recorded below.

Table-11 **Green Fodder Yield**

<u>S.No</u>	<u>LINES/VARIETIES</u>	<u>Green Fodder Yield (t/ha)</u>
1.	CP-96	38.85
2.	Elite	38.10
3.	CP-101	37.18
4.	CP-035	36.07
5.	SS-92-2	34.44
6.	IT82E715	32.55
7.	Rawan-2003 (check)	31.95
8.	CP-95	31.80
9.	CP-129	27.75
	LSD 0.05	5.32

Results depicted that the line CP-96 produced significantly high green fodder yield (38.85 t/ha) as compared to check variety Rawan-2003 (31.95 t/ha).

Adaptability Green Fodder Yield Trial Of Cowpeas

Seven advance lines /varieties were tested at three different locations of Punjab province for their green fodder yield and adaptability.

The average data of green fodder yield is given below.

Table-12 **Green Fodder Yield**

<u>Sr. No</u>	<u>Lines Varieties /</u>	<u>FRI, Sargodha</u>	<u>Agronomy (F.P) AARI</u>	<u>ESPU, Farooqabad</u>	<u>Average (t/ha.)</u>
1	CP-96	32.90	40.51	37.80	37.07
2	CP-162	33.30	40.51	37.30	37.04

3	CP-035	33.30	36.8	34.33	34.81
4	IT82E715	29.44	35.3	39.35	34.70
5	CP-271	29.40	31.93	36.14	32.49
6	Rawan-2003 (check)	30.15	31.18	35.20	32.18
7	CP-101	23.11	33.60	30.19	28.97
	LSD 0.05	4.01	-	3.25	

On an average the line CP-96 gave higher green fodder yield (37.07 t/ha) followed by check variety Rawan-2003 (32.18t/ha)

BNS & PRE-BASIC SEED PRODUCTION DURING KHARIF-2021

Pre basic and basic seed of all the kharif fodders was produced. The crop wise detail is given below.

Table-13 **BNS & Pre-basic Seed Production**

Crops	Varieties	Selected No. of Heads.	Selected No. of Head -Row.	Selected row to block.	BNS (kg.)	Pre-Basic (kg.)
Sorghum	Hegari	50	30/50	20/24	105	2333
	JS-263	30	16/30	08/16	20	193
	JS-2002	50	25/50	18/26	50	683
	Sorghum-2011	40	28/50	14/32	20	907
Pearl Millet	MB-87	30	14/30	07/12	07	70
	Sgd. Bajra	30	16/30	9/14	20	760
Maize	Sgd. 2002	50	23/50	14/23	30	1100
	Super Green Maize	50	38/50	29/38	100	2850

OATS BREEDING TRIALS

Collection, Evaluation And Maintenance Of Germplasm Of Oats

A total of 330 germplasm lines were maintained and data collected. Entries/lines were planted in 30 cm apart in paired rows. Off-type plants were rogued out to maintain their purity. The seed of these lines was preserved for further studies.

Hybridization Programme Of Oats

Oats hybridization is a continuous practice at this institute and basic tool for improving and widening the genetic basis of oats crop. In this regard total 35 crosses were attempted

keeping in view crop improvement parameters especially green fodder yield resistance against rust disease and stay green oats varieties.

Study Of Filial Generations Of Oats

Different generations of oats, F₂ to F₆ were studied and desirable recombinants were selected for next filial generation.

Table 14: **Filial Generations Of Oats**

Filial Generations	Entries Studied	Selected Progenies/Plants	Uniform Lines Selected
F1	9 crosses	3 crosses	-
F2	3 populations of 3 crosses	35 plants of 3 crosses	-
F3	30 plant progenies of 3 crosses	25 plants of 3 crosses	-
F4	20 plant progenies of 4 crosses	8 plants of 3 crosses	-
F5	9 plant progenies of 3 crosses	9 plants of 2 crosses	
F6	6 plants progenies of 2 crosses	-	2

Preliminary Green Fodder Yield Trial Of Oats.

A trial comprising of 12 lines/ varieties was laid out in RCBD with 3 replications having a plot size of 2.4 x 6.0m in 30 cm apart rows. Different morphological characters were recorded. Crop was harvested at 50% heading. Green fodder yield data were recorded and is given below:

Table-15 **Green Fodder Yield**

S.No.	Entry No	Line / Variety	G.F.Y. (t/ha)
1	1	Honey	86.34
2	8	Sgd-03	83.33
3	9	No.78	82.40
4	7	No.554	81.94
5	10	No.60	80.78
6	5	No.561	80.56
7	6	FRI-1545	79.40
8	4	FRI-02	79.40
9	3	Ever Green	79.17
10	11	FO-01-21	78.70
11	12	FO-02-21	78.01
12	2	Super Green Oats	72.92
LSD5%			5.595

As it is clear through the data given above the oats line Honey gave maximum green fodder yield (86.34 t/ha.) and was followed by lines Sgd-03 (83.33 t/ha.).

Advanced Green Fodder Yield Trial Of Oats.

The trial consisting of 10 promising lines/ varieties was laid out in RCBD with 3 replications having a plot size of 2.4 x6m in 30cm apart rows. The crop was harvested at 50% heading. Green fodder yield data were recorded and is given below:-

Table-16 **Green Fodder Yield**

S.No.	Name of Lines/ Varieties	Green Fodder Yield(t/ha)
1.	No.555	86.111
2.	FRI-024	85.647
3.	No.22377	84.722
4.	FRI-09	84.722
5.	Border	82.870
6.	Victory	82.870
7.	FO-02-20	80.787
8.	No.562	80.556
9.	Super Green oats	79.861
10.	FO-01-20	79.861
LSD 5%		3.23

Data revealed that the line No.555 out yielded all the entries included in the trial by giving 86.11 t/ha green fodder yield and was followed by FRI-024 (85.647 t/ha.).

Adaptability Green Fodder Yield Trial Of Oats

In order to pin point the best oats lines/ varieties, adaptation yield trial with 10 varieties was laid out in RCBD with 3 replications having a plot size of 1.8x6m. Data of green fodder yield were noted at 50% heading and are presented below:-

Table-17 **Green Fodder Yield**

Entry No.	Lines/ Varieties	Green Fodder Yield (t/ha)			
		FRI Sargodha	ARS Bahawalpur	ESPU Farooqabad	Average
1	No.689	102.78	52.9	39.19	64.96
2	FRI-152	104.63	67.2	41.66	71.16
3	Hay Sgd.	102.16	61.3	45.67	69.71
4	No.613	97.53	55.3	48.45	67.09
5	No.678	89.81	63.8	42.89	65.50
6	No.558	97.53	58.3	41.97	65.93
7	Awn Less	90.43	52.4	38.57	60.47
8	Super Green(Check)	79.01	59.8	45.37	61.39
9	FO-01-19	81.48	51.5	48.14	60.37
10	FO-02-19	79.01	66.5	46.6	64.04

Data revealed that the line FRI-152 out yielded all the entries included in the trial by giving 71.16 t/ha green fodder yield and was followed by Hay Sgd (69.71 t/ha.).

BERSEEM

Maintenance of germplasm.

Fifty genotypes of Berseem were planted in isolation. The material was well managed through timely field operations. Off-type plants were rouged out for purity maintenance. The seed was collected and stored for further studies.

Preliminary Green Fodder Yield Trial of Berseem

Field trial consisting of 10 lines/ varieties of Berseem was planted to evaluate them for green fodder yield potential. The experiment was laid out in RCBD with 3 replications having a plot size of 3x5m. The yield data was recorded and is given below:-

Table-18 **Green fodder yield**

S. No.	Lines/ Varieties	Green Fodder Yield (t/ha)
1.	SB-01-21	82.22
2.	SB-3-21	81.56
3.	SB-2-21	81.33
4.	FBM-02-21	79.78
5.	SB-6-21	79.11
6.	SB-5-21	78.89
7.	ANMOL (check)	78.89
8.	FBM-01-21	78.44
9.	Punjab Berseem (check)	78.22
10.	SB-4-21	76.89

Data revealed that line SB-01-21 gave the maximum green fodder yield (82.22 t/ha.) and was followed by the Line SB-03-21(81.56 t/ha.).

Advanced Green Fodder Yield Trial of Berseem

Field trial consisting of 08 lines of Berseem was planted to evaluate them for green fodder yield potential. The experimental was laid out in RCBD with 3 replications having a plot size of 3x5m. The yield data was recorded and is given below:-

Table-19 **Green fodder yield**

Sr.No.	Lines/ Varieties	Green Fodder Yield (t/ha)
1.	SB-1-20	93.56
2.	SB-3-20	90.89
3.	SB-5-20	88.89
4.	FB-2-20	88.00
5.	FB-4-20	88.00
6.	Anmol (Check)	84.22
7.	Punjab Berseem (Check)	83.11
8.	SB-2-20	78.89

Data revealed that line SB-01-20 gave the maximum green fodder yield (93.56t/ha.) and was followed by the line SB-03-20 (90.89 t/ha).

Adaptability green fodder yield trial of Berseem

Field experiment consisting of 8 lines of berseem was planted to evaluate for green fodder yield potential. The experiment was laid out in RCBD with 3 replications having a plot size of 3x5m.the trial was conducted at different ecological conditions of Punjab. The yield data was recorded and is given below:-

Table-20 **Green fodder yield**

Sr. No.	Lines / Varieties	Green Fodder Yield(t/ha)			
		FRI, Sargodha	ESPU, Farooqabad	ARS, B/Pur	Avg.
1.	SB-4-19	91.56	157	83.82	110.79
2.	SB-6-19	90.00	160	75.37	108.46
3.	SB-5-19	86.67	151	70.26	102.64
4.	FB-1-19	86.67	144	73.59	101.42
5.	FB-2-19	85.78	151	69.37	102.05
6.	Anmol(check)	85.78	144	64.48	98.09
7.	SB-3-19	82.89	138.7	67.14	96.24
8.	Punjab berseem(check)	82.00	141	61.36	94.79

Data showed that line SB-04-19 gave maximum green fodder yield (110.79 t/ha) followed by line SB-06-19 (108.46 t/ha).

National uniform fodder yield trial of Berseem

A trial consisting of 10 coded lines received from National Coordinator (Fodder), NARC, Islamabad was laid out with the objective to find out a variety/ line with higher green fodder yield potential. Methodology was adopted according to the plan proposed by the National Coordinator (Fodder), NARC, Islamabad. Green fodder yield data is presented in table below:-

LUCERNE

Collection and maintenance of germplasm.

220 Lucerne genotypes were sown in 60 cm apart rows of 10m length. The genotypes were properly maintained. Data regarding morphological traits were recorded. The crop is near to maturity and seeds will be collected for further studies.

Preliminary Green Fodder Yield Trial of Lucerne

Field trial consisting of 11 lines/ varieties was planted to evaluate them for green fodder yield potential. The experimental was laid out in RCBD with 3 replications having a plot size of 1.8x4 m² in 45cm apart rows. The yield data was recorded and is given below;

Table-21; **Green Fodder Yield**

S.No	Lines / Varieties	Green Fodder Yield (t/ha)
1.	Viger-02	80.04
2.	Exotic No. 505889	79.58

3.	No. 1103	77.73
4.	Exotic No. 502505	75.88
5.	Bover	69.40
6.	Exotic No. 516817	68.94
7.	Exotic No. 505890	68.01
8.	Sgd. Lucerne (Check)	67.09
9.	Exotic No. 516816	66.62
10.	China	65.24
11.	Exotic No. 502519	62.92
LSD (5%)		5.05

Data showed that line Vigor-02 gave maximum green fodder yield (80.04 t/ha.) followed by Exotic No. 505889 (79.58 t/ha.).

Advanced Green Fodder Yield Trial of Lucerne

Field trial consisting of 12 lines/ varieties was planted to evaluate them for green fodder yield potential. The experimental was laid out in RCBD with 3 replications having a plot size of 1.8x4 m in 45cm apart rows. The yield data was recorded and is given below:

Table-22: **Green Fodder Yield**

Sr.No	Lines / Varieties	Green Fodder Yield (t/ha)
1.	No. 565-86	74.03
2.	FA-01-20	70.79
3.	No. 53	70.33
4.	KQS-02	69.40
5.	No.1107	67.55
6.	SGS-82	67.09
7.	FRI001	66.16
8.	Sgd. Lucerne	65.24
9.	Vigor-01	64.31
10.	GR-800	63.85
11.	Oman	63.85
12.	Sunder	62.46
LSD (5%)		4.20

Data showed that line No.565-86 gave maximum green fodder yield (74.03 t/ha.) followed by FA-01-20 (70.79 t/ha.).

Zonal/ Adaptability Green Fodder Yield Trial of Lucerne

Field trial consisting of 8 lines/ varieties was planted to evaluate them for green fodder yield potential. The experimental was laid out in RCBD with 3 replications having a plot size of 1.8x4 m in 45 cm apart rows. The yield data was recorded and is given below:-

Table-23; **Green Fodder Yield**

Sr.No	Lines / Varieties	Green Fodder Yield (t/ha)			
		FRI, Sgd.	ARS, BWP	ESPU, Farooqabad	Average
1	No.7613	71.25	74.75	75.10	73.70
2	FL-121	67.09	70.22	72.00	69.77
3	5-IN-59	77.73	58.44	59.50	65.22
4	ICON-13	72.64	58.44	59.00	63.36
5	SARD-10	73.10	57.08	58.40	62.86
6	CUF-101	66.62	59.80	60.50	62.31
7	Sgd. Lucerne (check)	68.47	57.99	58.00	61.49
8	Silverado	68.01	54.36	54.50	58.96

The average data of all locations showed that line No.7613 gave maximum green fodder yield (73.70 t/ha.) followed by FL-121 (69.77 t/ha.).

BNS & PRE-BASIC SEED PRODUCTION DURING RABI-2021-22

Production of BNS and pre-basic seed of berseem, Lucerne and Oats was done according to the recommended protocols. The details of rabi crops BNS and pre basic seed is given below.

Table-24 **BNS & Pre-basic Seed Production**

Crop	Variety	Selected No. of Plants	Selected No. of Plant Rows	Selected No. of Row Blocks	BNS (Kgs)	Pre-basic (Kgs)
Berseem	Agaiti	50	32/50	41/64	132	2250
	Pachaiti	50	24/50	34/60	113	1020
	Anmol	50	36/50	39/72	102	1510
	Punjab Berseem	50	-	-	-	1530
Oats	S-2000	50	20/50	30/68	189	1280
	Sgd. Oats -2011	50	25/50	34/56	237	2400
	Super Green Oats	50	-	-	-	720
	Ever Green Oats	50	-	-	-	360
Lucerne	Sgd. Lucerne	50	21/50	19/32	14	200

AGRONOMY TRIALS

Effect of Legumes Intercropping On Sorghum Fodder Production

This trial was conducted to find out the effect of legumes intercropping on sorghum fodder production. Four treatments were used Sorghum+ Jantar, Sorghum + Guar, Sorghum+ Cowpeas and Sorghum alone. The system of lay out was RCBD with 4 replications having plot size of 3.6x6m. It was sown in the month of July. Data regarding G.F.Y was recorded and is given below:

Treatments	Green Fodder Yield (t/ha)
T1. Sorghum+Jantar	73.00
T2. Sorghum+Guar	71.10
T3. Sorghum+ Cowpeas	69.20
T4. Sorghum alone	67.20
LSD 5%	1.80

Results revealed that Sorghum+Jantar differed significantly in G.F.Y. It yielded higher green fodder (73.00 t/ha) followed by Sorghum+Guar (71.10 t/ha G.F.Y.).

Efficacy of different weedicides on seed production of Maize (Super Green)

This trial was conducted to find out the effect of different weedicides on seed production of maize. Five treatments were used. The system of lay out was RCBD with 4 replications having plot size of 3mx6m. It was sown in the month of August. Data regarding seed yield was recorded and is given below:

Treatments	Seed Yield (kg/ha)
T1=S-Metolachlor960EC@800ml / acre (pre- emergence)	16800.00
T2=Atrazine+Acetachlor 72.4%SE@750ml/acre(pre-emergence)	12222.32
T3=Mesotrione+Atrazine 55%SC@750ml/acre(post-emergence)	14100.11
T4= Atrazine38%SC @500ml / acre (post- emergence)	11111.20
T5= Control	8644.51
LSD 5%	155.72

Above table shows that S-Metolachlor 960EC@800ml / acre (pre- emergence) differed significantly in seed yield. It yielded higher seed yield (16800.00 kg/ha) followed by Mesotrione + Atrazine 55% SC@750ml/acre (post-emergence) Seed yield of 14100.11 kg/ha.

Effect of Row Spacing On Green Fodder Yield of a new Promising Line of Sorghum (B-203)

This agronomic trial was conducted to find out optimum sowing method for maximum fodder production of Sorghum Four Row spacing namely 15cm, 30cm, 45cm and 60cm were used.

The system of lay out was RCBD with 4 replications having plot size of 3.6.x6m.It was sown in the month of July. Data regarding G.F.Y was recorded and is given below.

Sowing methods(Row Spacing)	Fodder production (t/ha)
15cm	49
30cm	55
45cm	46
60cm	43

Data regarding GFY indicated that a new promising line of Sorghum (B-203) gave maximum GFY (55t/ha) with row spacing of 30cm followed by 15cm with GFY (49t/ha)

Determination Of Best Sowing Date For Optimum Seed Production Of Promising Line Of Oats

This agronomic trial was conducted to find out the optimum sowing date for seed production of a new promising line of Oats. Five sowing dates i.e. 15th October ,31th October, 15th November, 30th November and 15th December. The system of lay out was RCBD with four replication having plot size of 3mx5m. Data regarding seed yield was recorded and is given below:

Date of sowing	Seed Yield (t/ha)
15 th October	35
31 th October	40
15 th November	55
30 th November	50
15 th December	45

Data regarding seed yield indicated that a new promising line of Oats gave maximum seed yield (55t/ha) with sowing date of 15th November followed by 30th November with seed yield of (50t/ha).

Chemical Control Of Cuscuta In Alfalfa Crop

This agronomic trial was conducted to find out the best weedicides to control cuscuta in Alfalfa crop. Eight treatments were used. The system of lay out was RCBD with four replications having plot size of 3mx5m.

Treatment	Number of tillers/m ² before spray	Number of tillers /m ² after spray	Sprouting Vigour (%)
T1=Paraquat @2.5L/ha	195	178	>91
T2=Paraquat @3L/ha	221	215	>97
T3=Glyphosate@1250ml /ha	264	125	<48
T4=Glyphosate@1375ml /ha	184	75	<40
T5=Lactofen 24 EC@750ml/ha	196	184	>93
T6=Lactofen24 EC@875ml/ha	193	170	>88
T7=Haloxypop-p- Methyl@1500ml/ha	95	70	>73
T8=Haloxypop-p- Methyl@1625ml/ha	110	100	>90

Above table shows that if Paraquat @3L/ha sprayed just after cutting, Cuscuta may be controlled effectively and re sprouting of Alfalfa is least affected.

Chemical control Of Khabbal Grass in Alfalfa

This trial was conducted to find out optimum dose of weedicide for control of Khabbal grass. Data regarding seed production was recorded and is given below.

Treatment	Number of tillers/m ² before spray(Alfalfa)	Number of tillers /m ² after spray(Alfalfa)	Sprouting Vigour (%)	Number of tillers/m ² before spray(Khabbal grass)	Number of tillers /m ² after spray (Khabbal grass)	Sprouting Vigour (%)
T1=Quizalofop-p Ethyl@1500ml/ha	200	160	>80	110	10	9.09
T2=Quizalofop-p Ethyl@1750ml/ha	225	195	>88	105	6	5.71
T3=Haloxypop-p- Methyl@1500ml/ha	220	205	>93	110	4	3.63
T4=Haloxypop-p- Methyl@1750ml/ha	210	200	>95	120	2	1.66
T5=Control	196	95	<50	-	-	-

Above table data regarding chemical control of Khabbal grass indicated that Haloxypop-p Methyl@1750ml/ha controlled significantly (>95%) followed by Haloxypop-p-

Methyl@1500ml/ha (>93%) Above data indicated that Khabbal grass reduced plant population more than 50%.1

SOIL SCIENCE

Kharif-2021

SCREENING OF SORGHUM GERMPLASM AGAINST DIFFERENT SALINITY LEVELS

For the Screening of different lines/ accessions of Sorghum against different salinity levels a pots experiment was conducted at soil science Laboratory, Fodder Research Institute, Sargodha. The main objective of this experiment was to screen out the comparatively Salt Tolerant lines, Moderately Salt Tolerant Lines and Salt Sensitive Lines of Sorghum genotypes. Different soil salinity levels were developed in pots having 10 Kg soil in each pot by using the salts named Sodium Chloride (NaCl), Sodium Sulphate (Na₂SO₄), Calcium Chloride (CaCl₂) and Magnesium Sulphate (Mg₂SO₄).



Twelve lines of Sorghum were tested against different salinity levels in a pots experiment having different salinity levels. Data regarding Germination % and Mortality % has been given in the table below;

Comparatively Salt Tolerant Lines														
	PVX-801		YS-98		S-145		No.80010		No.1572		FRI-07		Sgd-013-1	
Salinity Levels	Em. (%)	Mrt (%)	Em (%)	Mrt (%)	Em (%)	Mrt (%)	Em (%)	Mrt (%)	Em (%)	Mrt (%)	Em (%)	Mrt (%)	Em (%)	Mrt (%)
Normal Soil (0.6-2.7 dSm ⁻¹)	100	0	100	0	100	0	100	0	100	0	100	0	100	0
5.1 dSm ⁻¹	88	0	83	0	81	0	78	0	75	0	70	0	68	0
7.4 dSm ⁻¹	74	0	66	0	61	0	59	0	55	0	54	0	45	0
9.1 dSm ⁻¹	59	0	58	0	55	0	55	0	52	0	51	0	50	0
11.8dSm ⁻¹	12	0	10	0	9	0	7	0	6	0	5	0	4	0
13.1 dSm ⁻¹	5	0	5	0	3	0	3	0	1	0	4	0	3	0

Moderately Salt Tolerant Lines				
	Hegari		Sgd-013-2	
Salinity Levels	Emer (%)	Mort (%)	Emer (%)	Mort (%)
Normal Soil (0.6-2.7 dSm ⁻¹)	100	0	100	0
5.1 dSm ⁻¹	62	0	57	0
7.4 dSm ⁻¹	25	0	24	0
9.1 dSm ⁻¹	12	0	8	0
11.8 dSm ⁻¹	5	0	3	0
13.1 dSm ⁻¹	2	0	2	0

Salt Sensitive Lines						
	Sorghum-2011		JS-2002		I-6	
Salinity Levels	Emer (%)	Mort. (%)	Emer (%)	Mort (%)	Emer (%)	Mort (%)
Normal Soil (0.6-2.7 dSm-1)	100	0	100	0	100	0
5.1 dSm-1	24	0	21	0	20	0
7.4 dSm-1	9	0	7	0	0	0
9.1 dSm-1	3	1	3	2	3	4
11.8dSm-1	2	2	1	2	2	5
13.1 dSm-1	0	0	0	0	0	0

Comparatively salt tolerant lines of sorghum performed better upto EC, 9 dS/m and showed above 50 % emergence with no mortality. Moderately salt tolerant lines of sorghum performed better upto EC, 5.1 dS/m and showed above 50 % emergence with minimum mortality. Salt Sensitive lines of sorghum can't performed better above EC, 4.0 dS/m and showed emergence below 24 % with mortality.

SCREENING OF PEARL MILLET GERMLASM AGAINST DIFFERENT SALINITY LEVELS

For the Screening of different lines/ accessions of Pearl Millet against different salinity levels a pots experiment was conducted at soil science Laboratory, Fodder Research Institute, Sargodha. The main objective of this experiment was to screen out the comparatively Salt Tolerant lines, Moderately Salt Tolerant Lines and Salt Sensitive Lines of Sorghum genotypes. Different soil salinity levels were developed in pots having 10 Kg soil in each pot by using the salts named Sodium Chloride (NaCl), Sodium Sulphate (Na₂SO₄), Calcium Chloride (CaCl₂) and Magnesium Sulphate (Mg₂SO₄).



Fig. : Twelve lines of Pearl Millet were tested against different salinity levels in a pots experiment having different salinity levels. Data regarding Germination % and Mortality % has been given in the table below;

Comparatively Salt Tolerant Lines										
	RCBK-948		Composite-II		CZK-923		Q-Bajra		Composite-IV	
Salinity Levels	Emer (%)	Mort (%)	Emer (%)	Mort (%)	Emer (%)	Mort. (%)	Emer (%)	Mort (%)	Emer (%)	Mort (%)
Normal Soil (EC= 0.6-2.7 dSm-1)	100	0	100	0	100	0	100	0	100	0
5.1 dSm-1	94	0	92	0	92	0	91	0	90	0
7.4 dSm-1	87	0	87	0	85	0	85	0	83	0
9.1 dSm-1	60	0	58	0	52	0	51	0	47	0
11.8dSm-1	30	0	29	0	36	0	30	0	28	0
13.1 dSm-1	6	0	4	0	2	0	2	0	2	0

Moderately Salt Tolerant Lines								
	Composite-I		G-Bajra		Y-84		Sgd-Bajra-2011	
Salinity Levels	Emer (%)	Mort. (%)	Emer (%)	Mort (%)	Emer (%)	Mort (%)	Emer (%)	Mort (%)
Normal Soil (0.6-2.7 dSm-1)	100	0	100	0	100	0	100	0
5.1 dSm-1	52	0	50	0	50	0	49.6	0
7.4 dSm-1	20	0	12	0	21.1	0	11.8	0
9.1 dSm-1	5	0	4.4	0	3.1	0	3	0
11.8dSm-1	2.4	0	2.3	0	2.1	0	2	0
13.1 dSm-1	1.5	0	1.1	0	0	0	0	0

Salt Sensitive Lines						
	Wt. Bajra		MB-87		Sgd.Bajra.2011	
Salinity Levels	Emer (%)	Mort(%)	Emer (%)	Mort (%)	Emer (%)	Mort (%)
Normal Soil (0.6-2.7 dSm-1)	100	0	100	0	100	0
5.1 dSm-1	19	0	16	0	10	0
7.4 dSm-1	4	0	3.6	0	3	1
9.1 dSm-1	2.4	1	2.1	1	2	2
11.8dSm-1	1.4	1.3	1.1	1.9	1	4
13.1 dSm-1	0	0	0	0	0	0

Comparatively salt tolerant lines of Pearl Millet performed better upto EC, 8-9.1 dS/m and showed above 50 % emergence with no mortality. While the moderately salt tolerant lines performed better at 4.5-5.1 dSm⁻¹. Salt sensitive lines didn't tolerate the salinity above 4dSm⁻¹ and showed negligible emergence above 4dSm⁻¹.

ROLE OF BORON IN SEED SETTING OF MAIZE

To evaluate the effect of different levels of boric acid on seed setting of maize an experiment was designed . Boron, Phosphorus and potassium was applied in the form of boric acid, DAP and SOP, respectively at the time of land preparation. While nitrogen was applied as Urea in two equal splits. Statistical design RCBD was used in layout plan with 3 replication.

Treatments	Grain Yield (Kg/ha)
T1= Boric acid @ 0 Kg ha ⁻¹ + NPK @ 90-80-62 Kg ha ⁻¹	2407.4
T2= Boric acid @ 1.0 kg ha ⁻¹ + NPK @ 90-80-62 Kg ha ⁻¹	2537.0
T3= Boric acid @ 1.5 kg ha ⁻¹ + NPK @ 90-80-62 Kg ha ⁻¹	2666.7
T4= Boric acid @ 2.0 kg K ha ⁻¹ + NPK @ 90-80-62 Kg ha ⁻¹	2685.2
T5= Boric acid @ 2.5 kg K ha ⁻¹ + NPK @ 90-80-62 Kg ha ⁻¹	2981.5
T6 =Boric acid @ 3.0 kg K ha ⁻¹ + NPK @ 90-80-62 Kg ha ⁻¹	2963.0
LSD 0.05	375.31

Treatment T5 regarding “Boric acid @ 2.5 kg K ha⁻¹ + NPK @ 90-80-62 Kg ha⁻¹” performed better and produced maximum grain yield which is 2981.5 Kgha⁻¹.

Soil samples were taken before sowing and after harvesting. The results of that soil samples are as under;

	Soil Texture	ECe (mScm ⁻¹)	pH	Organic Matter %	Available phosphorous (mg kg ⁻¹)	Available potassium (mg kg ⁻¹)
Before	Silty Loam	0.89	7.3	0.78	6.4	133
After	Silty Loam	0.71	7.1	0.85	5.5	130

EFFECT OF FOLIAR SPRAY OF BORON ON GRAIN YIELD OF MAIZE

A research trial was designed to find out the more effective dose of Boron as foliar application on grain yield of maize. Foliar spray of Boron was done at Tasseling initiation stage. Phosphorus and potassium was applied in the form of DAP and SOP, respectively at the time of land preparation. While nitrogen was applied as Urea in two equal splits. Statistical design RCBD was used in layout plan with 3 replication.

Treatments		Grain Yield Kg/ha
T1	No Boron application + NPK @ 90-80-62 Kg ha ⁻¹	2666.7
T2	0.5% B foliar application at Tasseling initiation stage + NPK @ 90 - 80 -62 Kg ha ⁻¹	2944.4
T3	1% B foliar application at Tasseling initiation stage + NPK @ 90 - 80 -62 Kg ha ⁻¹	2981.5
T4	1.5% B foliar application at Tasseling initiation stage + NPK @ 90 - 80 -62 Kg ha ⁻¹	3500.0
T5	2.0 % B foliar application at Tasseling initiation stage + NPK @ 90 - 80 -62 Kg ha ⁻¹	3481.5

Treatment T4 regarding “1.5% B foliar application at Tasseling initiation stage + NPK @ 90 - 80 -62 Kg ha⁻¹” performed better and produced maximum grain yield which is 3500 Kgha⁻¹.

Soil samples were taken before sowing and after harvesting. The results of that soil samples are as under;

Soil Analysis Report Before Sowing and after harvesting:						
Stages	Soil Texture	ECe (mScm ⁻¹)	pH	Organic Matter %	Available phosphorous (mg kg ⁻¹)	Available potassium (mg kg ⁻¹)
Before	Silty Loam	0.87	7.5	0.79	6.8	148
After	Silty Loam	0.83	7.3	0.84	5.9	141

NUTRITIONAL QUALITY ASSESSMENT OF KHARIF FODDERS

To assessment the nutritional quality of new lines of Kharif fodders the plant samples of different lines of Sorghum, Maize and Pearl Millet genotypes were taken, prepared and analyzed in Lab. for Quality parameters . Stage finalized with consultancy of concerned experts. Analysis report of different fodders for quality parameters is as under:

Sorghum					
Lines/ Varieties	DM %	Ash %	Crude Fat %	Crude Protein %	Crude Fiber %
No.9802	25.6	9.02	2.67	7.79	30.4
74702	24.8	8.86	2.49	8.23	33.2
6197	26.6	9.21	2.83	8.05	30.3
F=01-19	26.2	9.45	2.86	7.88	30.1
Osaf	24.2	9.53	2.27	8.40	34.7
PVK	25.4	9.91	2.63	7.96	31.3
8010	24.8	8.91	2.23	8.05	32.5
1572	25.8	8.54	2.48	8.40	32.6
5017	23.6	8.51	2.47	8.66	36.7
74724	27.8	9.12	2.32	8.93	32.1
YSS	26.4	8.95	2.28	8.31	31.5
F-01-2019	28.8	8.86	2.65	8.40	29.2
F-903	24.4	9.56	2.50	7.88	32.3
F-9806	25.4	9.54	2.86	8.05	31.7
FRI-04	27.6	9.26	2.42	8.14	29.5

Pearl Millet					
Lines/Varieties	DM %	Ash %	Crude Fat %	Crude Protein %	Crude Fiber %
Composite-V	39.6	9.12	3.44	9.45	21.8
Raj-Bajra	42.2	9.22	3.58	10.24	20.9
Watni	39.0	9.14	3.19	9.54	21.8
Sgd-Bajra-2011	37.6	10.06	3.29	10.41	24.0
MS-Bajra	48.4	9.86	3.09	9.28	23.0
RCBK-948	36.2	10.36	3.17	9.19	22.8
N-5	45.4	9.24	3.20	9.71	24.3
Y-84	40.2	9.26	3.00	9.80	22.3
S-2017	35.6	9.59	3.23	9.89	23.7
W-Raj-Bajra	35.2	10.35	3.04	10.15	23.1
King Bajra	34.8	9.56	3.11	10.24	21.1
Napier Grass-313 (1)	36.0	10.10	3.20	10.50	22.6
Napier Grass-313(2)	35.6	10.70	3.25	10.15	22.3

Maize					
Lines/ Varieties	DM %	Ash %	Crude Fat %	Crude Protein %	Crude Fiber %
Super green (Check)	31.6	7.13	2.38	11.8	23.0
No. 15360	33.2	8.65	2.51	11.9	25.7
No.15345	32.0	7.42	2.47	12.5	22.2
No.15336	29.6	7.02	2.56	13.7	23.6
No.15331	30.4	7.87	2.29	14.3	22.8
No.15332	33.6	7.24	2.49	13.9	21.0
No.15339	32.8	6.03	2.38	13.7	23.4
Neelum	34.0	6.51	2.50	12.6	25.6
AG-72	33.2	6.87	2.36	13.2	24.3
EV-1098	36.2	6.37	2.62	13.4	23.9
No.4455	35.8	7.75	2.80	13.9	24.3
No.1095	33.2	7.88	2.98	13.6	22.3
AG-2002	33.8	7.89	2.45	12.0	25.7
No.19185	34.6	8.50	2.40	12.1	26.2
SUNERI-4	32.8	7.80	2.48	12.3	27.0
No.2015	35.6	7.78	2.24	12.7	23.0
MYS-17	32.8	7.61	2.03	13.0	24.9
PAK-II	33.6	8.33	2.67	13.2	24.5
MMRI	36.4	9.21	2.89	13.7	26.7
YMH	31.2	8.70	2.47	13.8	27.2
NO.4557	36.8	9.53	2.42	13.6	27.2
YAM-113	31.8	9.91	2.72	14.1	24.8
C-706	35.4	9.11	2.63	12.0	25.8
SGD- 2002(Check)	32.4	8.54	2.59	12.2	26.1
Malka	32.0	8.51	2.13	13.4	25.7
Sahiwal-2002	34.4	8.45	2.33	14.3	24.5
No.15266	34.6	8.67	2.45	13.6	24.1
Sawat- Yellow	38.4	6.27	2.95	13.0	25.1
Sahiwal Gold	37.0	6.65	2.67	12.7	25.8
No. 15355	29.8	7.00	2.79	12.4	25.4
No.15264	33.4	7.11	2.74	12.7	23.1
Golden	33.0	7.72	2.63	13.2	25.4

PERFORMANCE EVALUATION OF PEARL MILLET GERMPLASM ON SALT AFFECTED SOIL

For the evaluation of the performance of Pearl Millet germplasm against soil salinity in natural field conditions and to find out the Comparatively Salt Tolerant lines, Moderately salt Tolerant lines and Salt Sensitive lines of Pearl Millet, a trial was conducted with the collaboration of the scientists of Soil Salinity Research Institute, Pindi Bhattian at their Research Area.



Twelve lines of pearl millet were tested in RCBD with 4 replications having plot size 1.8x5 m. Table Showing Germination (%), Mortality (%) and Green Fodder Yield (t ha⁻¹) of different accessions of Pearl Millet.

Treats	Lines	Emergence (%)	Mortality (%)	GFY t ha ⁻¹
Comparatively Salt Tolerant				
T6	RCBK-948	88	0	34.72
T2	Composite- II	85	0	33.60
T8	CZK-923	85	0	33.10
T9	Q-Bajra	84	0	33.70
T3	Composite- IV	80	0	30.80
Moderately Salt Tolerant				
T1	Composite-I	55	0	16.3
T5	G. Bajra	51.4	0	16.8
T7	Y-84	50.5	0	15.18
T11	SGD.Bajra.2020	50.1	0	15.20
Salt Sensitive Lines				
T4	Wt-Bajra	10	0	4.8
T12	MB-87	8	1.5	3.29
T8	Sgd Bajra 2011	6	2	3.42

Soil Texture	ECe (mScm-1) (Range)	pH (Range)	Organic Matter %	Available phosphorous (mg kg ⁻¹)	Available potassium (mg kg ⁻¹)	SAR (meL ⁻¹) ^{1/2}
Sandy Loam	8.70-10.20	8.71-9.9	0.58	6.9	157	28-46.70

Sandy Loam	8.70-10.20	8.81-9.8	0.60	6.7	152	27-47.20
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PERFORMANCE EVALUATION OF SORGHUM GERMPLASM ON SALT AFFECTED SOIL

For the evaluation of the performance of Sorghum germplasm against soil salinity in natural field conditions and to find out the Comparatively Salt Tolerant lines, Moderately salt Tolerant lines and Salt Sensitive lines of Pearl Millet, a trial was conducted with the collaboration of the scientists of Soil Salinity Research Institute, Pindi Bhattian at their Research Area. Twelve lines of Sorghum were tested in RCBD with 4 replications having plot size 1.8x5 m. The data is give below.



Table Showing Germination (%), Mortality (%) and Green Fodder Yield (t ha⁻¹) of different accessions of Pearl Millet.

Treat.	Lines	Emergence (%)	Mortality (%)	G.F.Y t ha ⁻¹
Comparatively Salt Tolerant Lines				
T10	PVK-801	78.9	0	30.9
T1	YS-98	78.3	0	30.6
T12	S-145	78.1	0	30.1
T8	NO-80010	75.3	0	29.8
T7	N0.1572	74	0	29.7
T11	FRI-07	70.9	0	29.2
T2	SGD-013-1	70.2	0	28.9
Moderately Salt Tolerant Lines				
T3	Sgd-013-2	50.9	0	14.9
T5	Hegari	48.6	0	12.8
Salt Sensitive Lines				
T4	Sorghum-2011	16	2	4.9
T6	JS-2002	14	2.7	4.4
T9	I-6	11.3	3	2.1

Soil Texture	ECe (mScm-1) (Range)	pH (Range)	Organic Matter %	Available phosphorous (mg kg ⁻¹)	Available potassium (mg kg ⁻¹)	SAR (meL ⁻¹) ^{1/2}
Sandy Loam	8.70-10.20	8.71-9.9	0.58	6.9	157	28-46.70
Sandy Loam	8.70-10.20	8.81-9.8	0.60	6.7	152	27-47.20

Rabi-2022

PERFORMANCE EVALUATION OF BERSEEM GERMPLASM ON SALT AFFECTED SOIL

For the evaluation of the performance of Berseem germplasm against soil salinity in natural field conditions and to find out the Comparatively Salt Tolerant lines, Moderately salt Tolerant lines and Salt Sensitive lines of berseem, a trial was conducted with the collaboration of the scientists of Soil Salinity Research Institute, Pindi Bhattian at their Research Area. Twelve lines of

Sorghum were tested in RCBD with 4 replications having plot size 1.8x5 m. the data is given below.

Table Showing Germination (%), Mortality (%) and Green Fodder Yield (t ha⁻¹) of different accessions of berseem.

Comparatively Salt Tolerant Lines		
Treat	Lines	GFY t/ha
T4	SB-1-17	22.27
T10	SB-4-17	21.8
Moderately Salt Tolerant Lines		
T1	SB-1-20	12.76
T3	SB-2-20	11.99
Salt Sensitive Lines		
T11	SB-4-19	7.44
T8	Punjab Berseem	4.90
T7	SB-6-19	2.06
T9	FB-1-18	1.7
T12	Anmol	1.5
T6	SB-6-20	0.00
T5	SB-7-20	0.00
T2	SB-8-20	0.00

Soil Analysis Before Sowing and after harvesting of Berseem field;					
Soil Texture	ECe (mScm ⁻¹)	pH	Organic Matter %	Available phosphorous (mg kg ⁻¹)	Available potassium (mg kg ⁻¹)
Clay Loam	4-5	8.3	0.44	5.1	107

Clay Loam	4-5	8.1	0.64	6.2	116
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STANDARDIZATION OF FERTILIZER DOSE FOR OATS LINES (AWNLESS) TO OBTAIN MAXIMUM GREEN FODDER YIELD.

A field trial was conducted to find out the best combination of NPK to obtain maximum green Fodder yield of new line of oats awnless. Phosphorus and potash was applied at sowing time, while nitrogen was applied in two split doses half at sowing time and the other half with 1st irrigation. Statistical design RCBD was used in layout plan with 3 replications.

Treatments	Green fodder yield (tha^{-1})
T1= 00-00-00 NPK kg ha^{-1}	59.19
T2= 102-76-56 NPK kg ha^{-1}	68.6.81
T3= 108-80-59 NPK kg ha^{-1}	78.49
T4= 114-84-62 NPK kg ha^{-1}	80.81
T5= 120-88-65 NPK kg ha^{-1}	80.84
T6= 126-102-68 NPK kg ha^{-1}	80.15

Treatment T4 performed better which produced Maximum Green Fodder Yield which is 80.81 tha^{-1} .

Soil Analysis report before sowing and after harvesting;						
Stage	Soil Texture	ECe (mScm^{-1})	pH	Organic Matter %	Available phosphorous (mg kg^{-1})	Available potassium (mg kg^{-1})
Before	Silty Loam	0.83	7.1	0.88	6.5	188
After	Silty Loam	0.79	6.9	0.92	5.5	183

STANDARDIZATION OF FERTILIZER DOSE FOR BERSEEM LINE (SB-1-17) TO OBTAIN MAXIMUM GREEN FODDER YIELD

A field trial was conducted to find out the best combination of NPK to obtain maximum green Fodder yield of line of Berseem . Phosphorus and potash was applied at sowing time, while nitrogen was applied in two split doses half at sowing time and the other half with 1st irrigation. Statistical design RCBD was used in layout plan with 3 replications.

TREATMENTS (NPK Kg ha^{-1})	GFY(tha^{-1}) OF 4 CUTS
T1 00-00-00	55.0
T2 21-70-40	76.9
T3 22-75-45	80.9

T4 23-80-50 (Rec.)	86.6
T5 24-85-55	86.9
T6 25-90-60	86.7

Treatment T4 performed better which produced Maximum Green Fodder Yield which is 86.6 tha^{-1} .

Soil Analysis Before Sowing;					
Soil Texture	ECe (mScm^{-1})	pH	Organic Matter %	Available phosphorous (mg kg^{-1})	Available potassium (mg kg^{-1})
Silty Loam	0.64	7.6	0.71	5.1	127
After Harvesting					
Silty Loam	0.57	7.1	0.96	6.4	133

STANDARDIZATION OF FERTILIZER DOSE FOR BERSEEM LINE (SB-4-17) TO OBTAIN MAXIMUM GREEN FODDER YIELD.

A field trial was conducted to find out the best combination of NPK to obtain maximum green Fodder yield of line of Berseem. Phosphorus and potash was applied at sowing time, while nitrogen was applied in two split doses half at sowing time and the other half with 1st irrigation. Statistical design RCBD was used in layout plan with 3 replications.

TREATMENTS (NPK Kg ha^{-1})	GFY(tha^{-1}) OF 4 CUTS
T1 00-00-00	59.0
T2 21-70-40	79.9
T3 22-75-45	82.7
T4 23-80-50 (Rec.)	88.1
T5 24-85-55	88.0
T6 25-90-60	86.4

Treatment T4 performed better which produced Maximum Green Fodder Yield which is 88.1 tha^{-1} .

Soil Analysis Before Sowing;					
Soil Texture	ECe (mScm^{-1})	pH	Organic Matter %	Available phosphorous (mg kg^{-1})	Available potassium (mg kg^{-1})
Silty Loam	0.64	7.6	0.71	5.1	127
After Harvesting					
Silty Loam	0.57	7.1	0.96	6.4	133

PLANT PROTECTION

SCREENING OF MAIZE GERMPLASM/LINES AGAINST STALK ROT OF MAIZE

The seed of maize germplasm entries sown in two lines of 3 meter length. The crop raised adapting standard agronomic practices. Disease incidence data recorded on appearance of the disease which is as follows:

S. No.	Reaction	No. of Varieties/lines
1	Resistant (R)	0
2	Moderately Resistant (MR)	10
3	Moderately Susceptible (MS)	6
4	Susceptible (S)	4
5	Highly Susceptible (HS)	0
	Total	20

SCREENING OF ADVANCE SORGHUM LINES AGAINST SHOOT FLY *ATHERIGONA SOCCATA* (ROND.) (DIPTERA: MUSCIDAE)

To mark the Sorghum Shoot Fly tolerant lines eight advanced line the germplasm sown were regularly surveyed to record the Shoot Fly infestation. Sorghum Shoot Fly infestation was recorded from middle row per plot from each treatment. Maximum 10.00% shootfly infestation were recorded on “Balo” while the minimum infestation were observed on F-01-2019 followed by FRI-02 with 5.33 and 6.00% shoot fly and were statistically at par with each other. Maximum Green Fodder Yield 66.67 and 62.67 t/h were also recorded in F-01-2019 and FRI-02.

S. No.	Treatments	% Shoot fly	Green Fodder Yield (t/h)
1	No-66001	8.00 bc	59.00 bc
2	Ausaf	9.33 ab	55.67 c
3	FRI-07	8.00 bc	60.00 bc
4	Balo	10.00 a	46.33 d
5	FRI-02	6.00 de	62.67 ab
6	Pak Sorghum	7.33 cd	58.67 bc
7	F-01-2019	5.33 e	66.67 a
8	F-01-2020	8.67 abc	55.33 c
LSD _{0.05}		0.77	2.47
CV (%)		11.98	5.21

SCREENING OF MAIZE GERMPLASM AGAINST STEM BORER

To find out comparative resistant/tolerant maize germplasm against stem borer 12 maize genotypes (including check) were sown at Fodder Research Institute, Sargodha following RCB Design with three repeats keeping RXR 30cm with plot size 5m X 1.8m. Advanced maize lines provided by the breeders were kept under observation. The data regarding infestation of stem borer were recorded from 10 plants selected at random per plot at 10 days interval starting from germination. Minimum 4.67% infestation of maize borer was recorded on MS-07-2021 with maximum 60.73 t/h green fodder yield. While maximum 13.33% infestation of maize borer were recorded on MS-04-2021 with minimum 42.97 t/h green fodder yield.

S. No.	Treatments	% Infestation of Maize borer	Green Fodder Yield (t/ha)
1	MS-07-2021	4.67	60.73
2	MS-01-2021	6.00	52.59
3	MS-02-2021	6.67	51.48
4	MS-03-2021	6.00	50.37
5	MS-08-2021	7.33	48.88
6	MS-05-2021	8.67	47.4
7	Super Green Maize (Check)	8.67	44.44
8	MS-06-2021	9.33	44.07
9	Sgd.2002 (Check)	10.00	43.7
10	MS-04-2021	13.33	42.97
LSD _{0.05}		0.94	7.23

Effect of different row spacing on population of maize stem borer (*Chilo partellus* Swinhoe) in maize seed crop

To evaluate the most appropriate row spacing having minimum borer attack trial was conducted at Fodder Research Institute, Sargodha. Maize variety super green maize was sown for the experiment with Randomized Complete Block Design. Line spacings 30,45,60 and 75 cm were selected for the experiment keeping plot size 2.7X6 m² with three replications. The trial was sown on 12.08.2021.

Percent infestation of maize borer was recorded after 15 days interval by observing all plants of middle rows. Maximum maize stem borer infestation was recorded in 30 cm row spacing followed by 45 and 60 cm row spacing with 9.33, 8.67 and 7.33 % maize stem borer infestation. While minimum 6.67% maize stem borer infestation was recorded in 75cm row spacing.

Efficacy of new chemistry foliar insecticides for the control of stem borer in seed crop of sorghum.

To find out the most effective insecticide for the control of stem borer a trial was conducted at FRI, Sargodha. For this purpose variety Hegari was sown with RCB Design keeping 45 cm row spacing with 6m row length. The trial was replicated thrice keeping plot size 2.7m×6m. Following treatments were applied.

T1= Chlorantraniliprole @ 50 ml/acre

T2= Flubendiamide @ 50 ml/acre

T3= Spinosad 75SP @ 40 ml/acre

T4= Methoxyfenozide 40EC @ 100 ml/acre

Treatments	% Maize Stem Borer Infestation
T1 = 30 cm	9.33 a
T2 = 45 cm	8.67 ab
T3 = 60 cm	7.33 ab
T4 = 75 cm	6.67 b
LSD _{0.05}	2.67

T5= Emamectin 1.90 EC @ 200 ml/acre

T6= Fipronil 2.5 EC @ 200 ml/acre

T7= Chlorfenapyr 2.3 EC @ 100 ml/acre

T8= Bifenthrin 20SP @ 300 ml/acre

T9 = Control

Borer infestation data was recorded before treatment and then 7 days after treatment from each plot.

Treatments	Mean stem borer infestation		
	BS	7 days AS	%Reduc.
T1= Chlorantraniliprole @ 50 ml/acre	8.67	2.33 d	73.1
T2= Flubendiamide @ 50 ml/acre	9.00	2.67 cd	70.4
T3= Spinosad 75SP @ 40 ml/acre	9.67	3.00 bcd	69.0
T4= Methoxyfenozide 40EC@ 100 ml/acre	10.00	4.00 b	60.0
T5= Emamectin 1.90 EC @ 200 ml/acre	9.33	3.00 bcd	67.9
T6= Fipronil 2.5 EC @ 200 ml/acre	9.00	2.33 d	74.1
T7= Chlorfenpyre2.3 EC @ 100 ml/acre	10.00	3.67 bc	63.3
T8= Bifenthrin 20SP @300 ml/acre	9.67	3.00 bcd	69.0
T9= Control	9.67	15.00 a	-55.2
CV (%)	8.82	16.76	
LSD _{0.05}	1.44	1.26	

Results clearly showed that maximum control of stem borer infestation was observed in Fipronil 2.5 EC treated plots with 74.1% reduction followed by Chlorantraniliprole with 73.1% reduction.

COMPARATIVE EFFICACY OF COMMONLY USED INSECTICIDES ON ALFALFA WEEVIL (*Hypera postica*) ON ALFALFA CROP

To evaluate best insecticides against Alfalfa Weevil a trial was conducted at FRI, Sargodha. Variety Sargodha Lucerne 2002 were sown by broadcast method following RCB Design with three replicates keeping plot size 3X5m². The crop was regularly observed to measure the larval abundance of *Alfalfa weevil*. The data regarding larval population was recorded from one square meter before and then 3, 6 and 9 days after treatment from each plot. Spray was done with a manually operated hand knapsack sprayer. Percent mortality was calculated by using the below mentioned formula:

$$\%M = ((Nbs - Nas) / Nbs) \times 100$$

where, %M - Percent mortality; Nbs - Insect abundance before spray; Nas – Insect abundance after spray

Following insecticides with their recommended doses were applied

Treatment	Insecticides	Dose/acre
T1	Coragen 20SC (Chlorantraniliprole)	50 ml
T2	Marshal 5EC (Lufenuron)	200 ml
T3	Runner 280SC (Methoxyfenozide)	100 ml
T4	Emamectin 1.9 EC (Emamectin benzoate)	200 ml
T5	Belt 48SC (Flubendiamide)	50 ml
T6	Fipronil 25EC	480 ml
T7	Pirate (chlorfenpyre) 360 SC	320 ml
T8	Control	

Insecticides			Mean abundance (MA) /m ² & % Mortality (M)						
S. #	Trade Name	Dose/Acre	Pre-T.	Post. T (3 days)		Post T. (6 days)		Post T(9 days)	
				MA	%M	MA	%M	MA	%M
T1	Coragen 20SC (Chlorantraniliprole)	50 ml	15.33 a	1.67 d	89.13	2.67 e	82.61	3.33 d	78.26
T2	Marshal 5EC (Lufenuron)	200 ml	15.67 a	2.33 cd	85.11	3.00 de	80.85	3.67 cd	76.60
T3	Runner 280SC (Methoxyfenozide)	100 ml	17.33 a	3.67 bc	78.85	4.00 bcd	76.92	5.00 bcd	71.15
T4	Emamectin 1.9 EC (Emamectin benzoate)	200 ml	17.00 a	2.67 bcd	84.31	3.33 cde	80.39	4.67 bcd	72.55
T5	Belt 48SC (Flubendiamide)	50 ml	16.67 a	1.67 d	90.00	2.67 e	84.00	3.67 cd	78.00
T6	Fipronil 25EC	480 ml	16.33 a	3.67 bc	77.55	4.33 bc	73.47	5.33 bc	67.35
T7	Pirate (chlorfenpyre) 360 SC	320 ml	16.67 a	4.00 b	76.00	4.67 b	72.00	5.67 b	66.00
T8	Control		16.33 a	20.67 a	-	22.00 a	-	26.67 a	-
	LSD _{0.05}		4.11	1.35		1.26		1.68	
	CV (%)		14.29	15.30		12.34		13.25	

Results showed that after three days after spray maximum control of alfalfa weevil was observed in Belt 48SC (Flubendiamide) with 1.67 mean abundance per m² followed by Coragen 20SC (Chlorantraniliprole) and Emamectin 1.9EC treated plots with 1.67 and 2.67 mean abundance per m² with 90.00, 89.13 and 84.31 percent reduction. The same trend was seen after post treatment of 6 and 9 days.

COMPARATIVE EFFICACY OF COMMONLY USED INSECTICIDES ON APHID ON OAT SEED CROP

Variety Super Green Oats were sown following RCB Design at FRI, Sargodha during Rabi 2021-22 to evaluate best insecticides against aphid. The trial was replicated thrice keeping plot size 3mX5m. Following insecticides were applied to check the aphid population on oat crop.

Treatment	Insecticides	Dose/acre
T1	Carbosulfan	500 ml
T2	Bifenthrin	250 ml
T3	Acetamaprid	200 ml
T4	Immidacloprid	200 ml
T5	Clothianidin 60% WS	150 ml
T6	Flunicamoid	80g
T7	Control	

Aphid infestation data per tiller will be recorded before treatment and 7 days after treatment from each plot.

S.#	Insecticides Name	Dose/ Acre	Mean Abundance (MA/tiller) Pre-T.	Post. T (after 7 days)	
				MA/tiller	%M
T1	Carbosulfan	500 ml	15.33	1.33 c	91.3
T2	Bifenthrin	250 ml	15.00	2.33 bc	84.4
T3	Acetamaprid	200 ml	15.67	2.67 bc	83.0
T4	Imidacloprid	200 ml	15.00	2.33 bc	84.4
T5	Clothianidin 60% WS	150 ml	14.67	2.67 bc	81.8
T6	Flunicamoid	80g	16.00	3.33 b	79.2
T7	Control		15.67	23.67 a	-
	LSD _{0.05}		1.55	1.45	

Maximum control of aphid was observed on Carbosulfan treated plot with 1.33 mean abundance per tiller aphid population with 91.3 percent mortality followed by Bifenthrine and

imidacloprid treated plots with 2.33 mean abundance per tiller of aphid population with 84.4 percent mortality in each treatment.

SCREENING OF BERSEEM ADVANCED LINES AGAINST ARMYWORM

To mark the tolerant germplasm against armyworm screening of berseem advanced lines against armyworm trial was conducted at FRI, Sargodha. Twelve varieties/lines were selected for the experiment. The germplasm sown was regularly surveyed to record the armyworm infestation.

Name of variety/Line	Mean No. of Armyworm/m²
SB-6-19	5.08 f
FB-1-19	5.08 f
FB-2-19	5.33 ef
SB-5-19	5.58 ef
Punjab Berseem (Check)	6.00 de
Anmol (Check)	6.42 cd
SB-3-19	6.67 cd
SB-4-19	7.17 bc
SB-1-20	7.17 bc
SB-3-20	7.50 ab
SB-2-20	7.83 ab
FB-1-20	8.00 a
CV(%)	7.33
LSD _{0.05}	0.81

Berseem resistant/tolerant lines SB-6-19, FB-1-19, FB-2-19, SB-5-19 with 5.08, 5.08, 5.33, 5.58 mean number of armyworm/m² were pin pointed for further breeding experiments.

DETERMINATION OF BEST SOWING DATE FOR MANAGEMENT OF APHID IN OATS

To find out optimum sowing date for the management of aphid in oats following sowing dates were studied.

Sowing Dates:

T1	15 th October
T2	31 th October
T3	15 th November
T4	30 th November
T5	15 th December

The trial was layout with RCB Design keeping plot size 1.8m X 6m keeping row spacing 30cm. Line sowing method was applied with fertilizer doses NPK(115-90-62.5)kg/ha

Treatments	Mean Aphid/tiller
T1 = 15 th October	8.22 e
T2 = 31 th October	9.67 d
T3 = 15 th November	11.28 c
T4 = 30 th November	14.22 b
T5 = 15 th December	15.46 a
LSD _{0.05}	0.74

Results indicate that maximum aphid/tiller population was observed in late sowing oat crop while early sown oat crop received less attack of aphid attack i.e., 15th December and 30th November sown oat crop received 15.46 and 14.22 aphid per tiller attack while 15th October and 31th October sown oat crop received 8.22 and 9.67 aphid per tiller attack.

DAIRY TECHNOLOGY DIVISION

EFFECT OF PALATABILITY ON VOLUNTARY FEED INTAKE OF PROMISING LINES/VARIETIES OF SORGHUM

Chaffed & weighed quantity of each Sorghum line/variety was offered to twelve buffaloes according to NARC schedule in nutrition stalls following Cafeteria method. Experimental animals were provided 20% additional fodder than their actual requirements. Daily consumption was recorded to evaluate palatability and voluntary feed intake. The outcomes of experiment are explained below.

Parameters	T1 SGD-013-1	T2 SGD-013-2	T3 S-9901	T4 Sorghum-2011
Quantity fed (kg)	60.0	60.0	60.0	60.0
Voluntary feed intake (kg)	48.000A	47.625A	45.000A	44.875A
LSD _{0.05}				3.72

Palatability (%)	79.998A	79.375A	75.000A	74.790A
LSD0.05				6.21

Effect Of Palatability On Voluntary Feed Intake Of Promising Lines/Varieties Of Pearl Millet

Each pearl millet line/variety was chaffed and offered to three buffaloes after weighing. Cafeteria method was followed according to NARC schedule. 20% additional fodder was given to these animals than their actual requirements. Consumption of these fodders was noted to determine the palatability and voluntary feed intake. The result of experiment is given below.

Parameters	Composite- IV	Q-Bajra	G-Bajra	Sargodha Bajra-2011
Quantity Fed (kg)	60.0	60.0	60.0	60.0
Voluntary Feed intake (kg)	44.250A	44.950A	44.900A	43.825A
LSD 0.05				3.62
Palatability (%)	73.748A	74.918A	74.832A	73.043A
LSD 0.05				6.05

Influence Of Plant Maturity Stages On Silage Quality Of Sorghum Cultivar In Dairy Bufaloes

Silage was prepared from sorghum at different maturity stages i.e. Milky Stage (MS), Dough Stage (DS) and Physiologic Maturity Stage (PM)) according to standard method. The prepared sorghum silage was analyzed for Dry matter %, crude protein %, fat %, Crude Fiber%, ash % and Nitrogen free Extract (NFE). The sorghum silages were fed to dairy buffaloes to see the effect of silage on milk quality and milk production. Dry matter was estimated for daily requirement of animals. Nine multiparous buffaloes of almost similar stage and lactation number was selected and fed on different silages of sorghum cultivar. Treatments were repeated thrice. Daily feed intake and milk yield was recorded. Data recorded was analyzed statistically.

Proximate Composition of Sorghum Silages at Different Maturity Stages			
	T1. Milky Stage	T2. Dough stage	T3. Physiological Maturity stage
Dry Matter %	24.77±0.49	25.56±1.18	26.39±1.67

Crude Protein %	11.36±0.75	10.13±0.51	10.52±0.41
Crude Fat %	1.95±0.19	2.11±0.13	2.28±0.29
Crude Fiber %	30.44±1.05	28.09±2.35	26.44±1.78
Ash %	8.24±0.30	8.83±0.30	8.78±0.63
NFE %	47.99±1.25	50.82±2.09	51.96±1.12

EFFECT OF SORGHUM SILAGE FEEDING ON MILK PRODUCTION AND FEED INTAKE				
Diet	Feed Offered (Kg)	Intake (Kg)	Milk production (Liters) Before Trial	Milk production (Liters) Before Trial
T1. Milky Stage	25.0	16.86B	9.200A	9.833A
T2. Dough stage	25.0	20.067A	8.400B	9.800A
T3. Physiological Maturity stage	25.0	15.900B	8.266B	9.766A
LSD 0.05		1.38	0.47	1.46

Evaluation Of Maize Varieties For Silage Quality And Milk Production In Dairy Animals

Silage was prepared from different maize varieties i.e. Sargodha-2002, Super green maize, Malka, MMRI Yellow and Pearl according to standard method. The prepared maize silages was analyzed for Dry matter %, crude protein %, fat %, Crude Fiber%, ash % and Nitrogen free Extract (NFE). The maize silages were fed to dairy buffaloes to see the effect of silage on milk production. Dry matter was estimated for daily requirement of animals. Multiparous buffaloes of almost similar stage and lactation number was selected and fed on different silages of maize varieties. Daily feed intake and milk yield was recorded. Data recorded was analyzed statistically.

Proximate Composition Of Different Maize Varieties Silages					
	Dry Matter %	Crude Protein %	Crude FAT %	Crude Fiber %	Ash%
T1. Sargodha 2002 Maize	29.24±2.30	8.17±0.08	1.94±0.18	27.6±1.60	6.73±0.43
T2. Super Green	33.38±1.07	8.07±0.89	1.79±0.18	27.81±0.32	7.23±0.97

Maize					
T3. Malka	31.24±2.90	7.64±0.46	1.44±0.09	23.65±0.70	7.03±0.85
T4. MMRI Yellow	31.98± 1.89	7.35±0.58	1.94±0.16	25.52±1.06	7.31±0.41
T5. Pearl maize	31.96± 1.57	8.07±0.72	1.64±0.11	24.49±0.66	7.78±0.73

Effect Of Maize Silage Feeding On Milk Production And Feed Intake					
Diet	Feed Offered (Kg)	Intake (Kg)	Milk production (Liters) Before Trial	Milk production (Liters) Before Trial	
T1. Silage of Pearl maize	25.0	19.50AB	8.13A	8.80BC	
T2. Silage of MMRI Yellow	25.0	20.23AB	7.73A	8.56C	
T3. Silage of Super Green Maize	25.0	21.70A	8.46A	9.90A	
T4. Silage of Sgd.2002	25.0	19.53AB	7.96A	9.10B	
T5. Silage of Malka	0.25	18.43B	8.23A	9.20B	
LSD 0.05		2.39	0.76	0.51	

EFFECT OF MAIZE SILAGE FEEDING ON MILK QUALITY CHARACTERISTICS							
Diet	Fat (%)	SNF (%)	T. Solids (%)	Protein (%)	Lactose (%)	Acidity (%)	pH
T1. Silage of Pearl maize	6.55B	8.67AB	15.23A	3.87B	4.12A	0.08A	6.91A
T2. Silage of MMRI Yellow	7.25A	7.98BC	15.24A	3.75B	3.36D	0.08A	6.92A
T3. Silage of Super Green Maize	6.73B	7.90C	14.64AB	3.52C	3.73BC	0.08A	6.91A
T4. Silage of Sgd.2002	6.16C	7.88C	14.043B	3.74B	3.64C	0.09A	6.91A
T5. Silage of Malka	6.73B	8.83A	15.563A	4.11A	3.91AB	0.08A	6.92A
LSD 0.05	0.28	0.71	0.96	0.20	0.22	0.02	0.02

DAIRY TECHNOLOGY SECTION RABI TRIALS

EFFECT OF BERSEEM AND ALFALFA HAY ON MILK PRODUCTION AND COMPOSITION OF DAIRY BUFFALOES

The hay of Berseem and Alfalfa was prepared by standard method and analyzed for proximate composition. The hay was fed to buffaloes to determine its effect on milk production and Milk composition (Milk fat, SNF, Total Solids, Protein, Lactose, pH, Acidity). Eight dairy buffaloes of almost similar stage and lactation number was selected and fed on different types of hay at ad-libitum. Daily feed intake and milk yield was recorded. The data was analyzed statistically.

Proximate Composition of Berseem and Alfalfa Hay			
Sr. #	Parameters	Berseem Hay	Alfalfa Hay
1	DM (%)	88.9±1.10	89.2±2.00
2	Moisture (%)	11.1±1.11	10.8±2.00
3	Ash (%)	11.13±0.10	10.62±0.14
4	Crude Protein (%)	16.67±0.30	21.06±0.30
5	Crude Fat (%)	1.97±0.10	2.09±0.13
6	Crude Fiber (%)	19.5±2.0	20.5±0.60
7	NFE (%)	39.63±2.34	34.92±2.56

Diet	Milk Production (Liters)	
	Before Trial	After Trial
T1 (Berseem Hay)	6.85 A	7.70 A
T2 (Alfalfa Hay)	7.05 A	7.75 A
LSD 5%	0.76	0.37

Feed Intake and Milk Composition			
Parameter	T1 (Berseem Hay)	T2 (Alfalfa Hay)	LSD 0.05
Feed Intake (Kg)	9.80 A	7.30 B	0.68
Fat (%)	7.14 A	5.90 B	1.18
SNF (%)	7.52 A	9.19 A	2.14
TSS (%)	14.67 A	15.09 A	1.90
Density	25.72 A	33.80 A	9.15
Lactose (%)	3.51 A	4.07 A	0.96
Salts (%)	0.53 B	0.66 A	0.11

Protein (%)	3.48 A	4.19 A	1.02
pH	6.91 A	6.91 A	0.018
Acidity (%)	0.08 A	0.08 A	0.018
Freezing Point	-0.425 A	-0.530 A	0.11

NUTRITIONAL EVALUATION OF VARIOUS STAGES OF MATURITY OF OAT HAY AND ITS EFFECT ON MILK PRODUCTION AND COMPOSITION

The hay of oats at various stages of maturity (Boot Stage, Flowering stage, Dough stage) was prepared by standard method and analyzed for proximate composition (DM %, Crude protein %, Crude fat %, Crude Fiber %, Ash %). The hay was fed to buffaloes to determine its effect on milk production and Milk composition (Milk fat, SNF, Total Solids, Protein, pH, Acidity). Nine dairy buffaloes of almost similar stage and lactation number was selected and fed on different types of oat hay at ad-libitum. Daily feed intake and milk yield was recorded. The data was analyzed statistically.

PROXIMATE COMPOSITION OF OAT HAY AT DIFFERENT MATURITY STAGES (Boot Stage, Flowering stage, Dough stage)

Sr. #	Parameters	T1 Oat Hay at Boot Stage	T2 Oat Hay at flowering stage	T3 Oat Hay at Dough stage
1	DM (%)	88.73±1.72	88.0±1.05	89.26±0.95
2	Moisture (%)	11.26±1.72	12.0±1.05	10.73±0.95
3	Ash (%)	11.94±0.19	9.86±0.22	11.93±0.10
4	Crude Protein (%)	9.65±0.20	9.71±0.22	9.33±0.25
5	Crude Fat (%)	1.32±1.32	1.46±0.14	1.26±0.09
6	Crude Fiber (%)	26.46±6.02	23.73±2.65	22.73±2.00
7	NFE (%)	39.35±4.64	43.22±3.39	44.00±3.39

Diet	Milk Production (Liters)	
	Before Trial	After Trial

T1. Oat Hay at Boot Stage	6.73 A	7.50 A
T2 Oat Hay at flowering stage	6.76 A	7.43 A
T3. Oat Hay at Dough stage	6.73 A	7.36 A
LSD 5%	0.590	0.523

Feed Intake and Milk Composition				
Parameter	T1 (Oat Hay at Boot Stage)	T2 (Oat Hay at Flowering Stage)	T3 (Oat Hay at Dough Stage)	LSD 0.05
Feed Intake (Kg)	8.66B	9.66A	9.56A	0.50
Fat (%)	5.14 B	5.69 A	5.19 B	0.42
SNF (%)	8.17 B	8.26 B	10.44 A	0.49
TSS (%)	13.96 B	13.95 B	15.64 A	1.25
Density	30.97 B	31.24 B	39.99 A	6.23
Lactose (%)	3.93 B	3.86 B	4.67 A	0.52
Salts (%)	0.60 B	0.63 AB	0.72 A	0.10
Protein (%)	3.68 B	3.77 B	5.05 A	0.17
pH	6.91 A	6.92 A	6.92 A	0.02
Acidity (%)	0.09 A	0.08 A	0.08 A	0.02
Freezing Point	-0.43 A	-0.46 C	-0.46 B	5.85

ANNUAL DETAILED TECHNICAL REPORT FOR THE YEAR 2021-22



AGRICULTURAL RESEARCH
STATION,
BAHAWALPUR

1 **BREEDING STUDIES**

1.1 **COLLECTION, EVALUATION AND MAINTENANCE OF GUAR GERMPLASM**

An experiment consisting of 270 genotypes/accessions of guar including one check was sown on 24.06.2021 according to Augmented Design. The experiment was harvested during November, 2021. The genotypes/ accessions of guar were evaluated and maintained under close observation and a wide range of values for various characteristics was observed in all the genotypes. Seed of the accessions/genotypes was harvested on maturity and was preserved for further studies. Data on various traits were recorded and results are given as under:

Table 1: Results of the Trial Evaluation & Maintenance of Guar Germplasm

Sr. No.	Characters	Range
1	Days to 50% flowering	42-68 days
2	Days to 90% maturity	100-150 days
3	Plant height	40-200 cm
4	Branches plant ⁻¹	0-17
5	Clusters plant ⁻¹	8-34
6	Pods plant ⁻¹	23-410
7	Pods cluster ⁻¹	3-16
8	Pod length	3-7cm
9	Seeds pod ⁻¹	4-10
10	1000-Seed weight	20-34gm
11	Green fodder yield	14-34 tons ha ⁻¹
12	Seed Yield	650-2600 Kg ha ⁻¹



Figure 01: Evaluation and maintenance of guar germplasm

1.2 HYBRIDIZATION OF GUAR AND STUDY OF FILIAL GENERATIONS

To combat biotic (insect pests/ diseases), abiotic stresses (drought) and to improve seed and fodder yield, hybridization programme was undertaken by crossing guar genotypes. As flower of guar plant is very minute, it is very difficult to get artificial crossing successful. Despite this fact, following 12 fresh crosses were attempted:

Table 2: Hybridization of Guar

Cross #	Name of Cross	No. of Crosses attempted	No. of successful pods harvested
1.	BR-21 x S-6536	80	-
2.	S-6536 X BR-21	75	-
3.	BR-2017 X S-6547	100	1
4.	S-6547 X BR-2017	60	-
5.	BR-90 X S-6161	65	-
6.	S-6161 x BR-90	110	-
7.	BR-99 X S-6642	50	1
8.	S-6642 X BR-90	60	-
9.	S-6159 X S-6384	85	-
10.	S-6384 X BR-2017	105	1
11.	BR-90 X S-6666	55	-
12.	S-6543 X BR-2017	45	-

F₀ seed was harvested for growing F₁ during Kharif, 2022.

Furthermore, following generations were maintained during Kharif, 2021:

Generation	Parental Crosses/ progenies studied	Crosses/plants/ progenies selected
F ₁	4 (Crosses)	3 (Crosses)
F ₂	3 (Crosses)	25 (Plants)
F ₃	30 (Progenies)	20 (Plants)
F ₄	22 (Progenies)	15 (Plants)
F ₅	4 (Progenies)	3 (Plants)



Figure 02: Hybridization of guar

1.3 IRRADIATION OF GUAR SEED TO CREATE GENETIC VARIABILITY

The seed of two Varieties/lines of guar BR-21 and S-6161 was sent to NIAB, Faisalabad for its treatment with radiations at 05 different doses i.e. 10Kr, 20Kr, 30Kr, 40Kr and 50Kr. After irradiation process, 10 mutants (05 of each guar line) were received from NIAB, Faisalabad. The radiated seed of above varieties were sown on 23.06.2021 to raise M₁ Generation. Out of these 10 Mutants, 05 were selected to raise M₂ generation during Kharif, 2022. Following generation were studied during Kharif, 2021:

Generation	Mutants/progenies studied	Mutants/plants/ progenies selected
M ₁	10 (Mutants)	04 (Mutants)
M ₂	03 (Mutants)	15 (Plants)
M ₃	20 (Mutant)	10 (Plants)

1.4 IDENTIFICATION OF PROMISING PROGENY LINES OF GUAR

An experiment consisting of 50 progenies and 36 superior progenies along with two check was sown on 24.06.2021. The similar agronomic practices were adapted throughout the growth period. The experiment was harvested during November, 2021. On the basis of good performance 18 superior progenies were selected for their evaluation in preliminary yield trials during Kharif, 2022. Furthermore, 50 new single plants were selected from available guar material to grow plant to progeny rows during Kharif, 2022.

Table 3: Previous Year Results

	Single plants/progenies studied	Single plants/progenies selected
Selection of Single plants	-	50 (plants)
Selection of Superior progenies	50 (progenies)	25 (plants)
Final selection of better performing progenies for evaluation in replicated yield trials	36 (progenies)	18 (progenies)



Figure 3: Promising progeny lines experiment

1.5 PRELIMINARY GUAR YIELD TRIALS

1.5.1 PRELIMINARY GUAR YIELD TRIAL-I (A-I)

A-I trial consisting of 08 strains including two checks was sown on 23.06.2021. The experiment was laid out according to RCBD having 3 repeats and plot size of 1.8 m x 6.0 m. The similar agronomic practices were adapted for all the entries throughout the growth period. The experiment was harvested during November, 2021 and yield data were recorded which are given as under:

Table 4: Results of Preliminary Guar Yield Trial -I (A-1)

Entry Name	Seed Yield (Kg ha⁻¹)	+/- %over than check (BR-21)	+/- % over than check (BR-2017)
S-6790	2825	17.22	39.44
S-6808	2743	13.82	35.39
S-6793	2705	12.24	33.51
S-6801	2540	5.39	25.37
S-6812	2450	1.66	20.93
BR-21 (Check)	2410	0.00	18.95
BR-2017 (Check)	2026	-15.93	0.00
S-6800	1850	-23.24	-8.69
S-6784	1512	-37.26	-25.37
S-6794	1208	-49.88	-40.38
LSD (0.05)	269.7		

The data showed that strain S-6790 gave the maximum seed yield of 2825 kg ha⁻¹ (17.22% and 39.44% higher than checks) followed by the strain S-6808 which gave 2743 kg ha⁻¹ than checks BR-21 (2410 kg ha⁻¹) and BR-2017 (2026 kg ha⁻¹). The three strains S-6800, S-6784, S-6794 were the lowest yielders (1850-1208 kg ha⁻¹) than the check varieties BR-21 and BR-2017. Five strains S-6790, S-6808, S-6793, S-6801, and S-6812 out yielded than check varieties BR-21 and BR-2017 and were selected for evaluation in B-trial during the year 2022 on the basis of good performance. Highly significant differences were found among the mean values of the genotypes.



Figure 04: Preliminary Guar Yield Trial -I

1.5.2 PRELIMINARY GUAR YIELD TRIAL -II (A-II).

A-II trial comprising of 07 strains including two checks were sown on 23.06.2021. The experiment was laid out according to RCBD having 3 repeats and plot size of 1.8 m x 6m. The similar agronomic practices were adapted for all the entries throughout the growth period. The data were recorded for fodder yield during August, 2021 and for seed yield during November, 2021 which are given as under:

Table: 5 Results of Preliminary Guar Yield Trial -II (A-II)

Entry Name	Seed Yield (Kg ha⁻¹)	+/- %over than check (BR-21)	+/- % over than check (BR-2017)
S-6818	2402	15.59	20.40
S-6802	2341	12.66	17.34
S-6820	2197	5.73	10.13
S-6813	2166	4.23	8.57

S-6815	2155	3.71	8.02
BR-21 (Check)	2078	0.00	4.16
S-6811	2024	-2.60	1.45
BR-2017 (Check)	1995	-3.99	0.00
S-6798	889	-57.22	-55.44
LSD (0.05)	381.4		

Table: 6 Results of Preliminary Fodder Yield Trial -II (A-II)

Entry Name	Fodder Yield (Tons ha⁻¹)	+/- %over than check (BR-21)	+/- % over than check (BR-2017)
S-6818	34.7	19.24	15.67
S-6802	31.8	9.28	6.00
S-6820	33.5	15.12	11.67
S-6813	29.9	2.75	-0.33
S-6815	34.6	18.90	15.33
BR-21 (Check)	29.1	0.00	-3.00
S-6811	28.1	-3.44	-6.33
BR-2017 (Check)	30	3.09	0.00
S-6798	22	-24.40	-26.67
LSD (0.05)	2.67		

As for as the seed yield is concerned, the strain S-6818 out yielded all the contestants and gave seed yield of 2402 Kg ha⁻¹ (15.59% higher than BR-21 and 20.40% higher than BR-2017 checks) followed by the variety S-6802 which produced 2341 Kg ha⁻¹ as compared to check variety BR-2017 (2078 Kg ha⁻¹). However, in case of fodder yield, strain S-6818 produced maximum fodder yield of 34.7 t ha⁻¹ followed by S-6815 (34.6 t ha⁻¹) than check varieties BR-21 (29.1 t ha⁻¹) and BR-2017 (30.0 t ha⁻¹). The five strains S-6818, S-6802, S-6820, S-6813 and S-6815 gave 2.75% to 19.24% higher seed yield than the check variety BR-21. On the basis of good performance these five strains were selected for further evaluation in B-trials during the year 2022. Statistical analysis revealed highly significant differences among the mean values.

1.6 REGULAR GUAR YIELD TRIAL (B-Trial)

B-trial comprising of 11 strains including two check varieties was sown on 23.06.2021. The experiment was laid out according to RCBD having 4 repeats and plot size of 2.7m x 7.2m. The similar agronomic practices were adapted for all the entries throughout the

growth period. The data were recorded for fodder yield during August, 2021 and for seed yield during November, 2021 which are given as under:

Table: 7 Results of Regular Guar Yield Trial

Strains	Seed yield (Kg ha ⁻¹)	± % over check (BR-21)	± % over check (BR-2017)
S-6723	2780	16.08	25.79
S-6754	2733	14.11	23.67
S-6749	2620	9.39	18.55
S-6728	2575	7.52	16.52
S-6733	2510	4.80	13.57
S-6744	2400	0.21	8.60
BR-21 (Check)	2395	0.00	8.37
S-6724	2320	-3.13	4.98
BR-2017 (Check)	2210	-7.72	0.00
S-6740	2044	-14.66	-7.51
S-6731	1705	-28.81	-22.85
S-6752	1455	-39.25	-34.16
S-6727	1013	-57.70	-54.16
LSD (0.05)	258.2		

Table: 8 Results of Regular Guar Fodder Yield Trial

Strains	Fodder yield (t ha ⁻¹)	± % over check (BR-21)	± % over check (BR-2017)
S-6723	33.0	4.07	7.14
S-6754	32.5	2.49	5.52
S-6749	35.0	10.38	13.64
S-6728	30.1	-5.08	-2.27
S-6733	31.3	-1.29	1.62
S-6744	34.3	8.20	11.40
BR-21 (Check)	31.7	0.00	2.95
S-6724	28.0	-11.70	-9.09
BR-2017 (Check)	30.8	-2.87	0.00
S-6740	25.1	-20.85	-18.51
S-6731	26.2	-17.38	-14.94
S-6752	22.1	-30.31	-28.25
S-6727	20.0	-36.93	-35.06
LSD (0.05)	2.23		

In case of seed yield, the strain S-6723 out yielded all the contestants and gave seed yield of 2780 Kg ha⁻¹ (16.08% and 25.79% higher than check varieties BR-21 and BR-2017, respectively) followed by the strain S-6754 (2733 kg ha⁻¹) as compared to check varieties BR-

21, BR-2017 (2395 and 2210 kg ha⁻¹). The first six strains gave higher seed yield than the check varieties. As for as the fodder yield is concerned, strain S-6749 produced maximum fodder yield of 35.0 t ha⁻¹ followed by S-6744 (34.31 t ha⁻¹) than check varieties i.e. BR-21 (31.71 t ha⁻¹) & BR-2017 (30.8 t ha⁻¹). On the basis of good performance, six strains S-6723, S-6754, S-6749, S-6728, S-6733 and S-6744 were selected for further evaluation in C-trials during the year 2022. Statistical analysis revealed highly significant differences among the mean values.



Figure 05: Regular Guar Yield Trial

1.7 ADVANCE GUAR YIELD TRIAL (C-Trial)

An experiment comprising of 06 strains including two checks was sown on 23.06.2021. The experiment was laid out according to RCBD having 4 repeats and plot size of 2.7m x 7.2m. The similar agronomic practices were adapted for all the entries throughout the growth period. The data were recorded for fodder yield during August, 2021 and for seed yield during November, 2021 which are given as under:

Table: 9 Results of Advance Guar Yield Trial

Strains	Seed yield (Kg ha⁻¹)	± % over check (BR-21)	± % over check (BR-2017)
S-6710	2688	12.19	19.47
S-6692	2565	7.05	14.00
S-6686	2510	4.76	11.56

BR-21 (Check)	2396	0.00	6.49
BR-2017 (Check)	2250	-6.09	0.00
S-6683	1750	-26.96	-22.22
S-6695	1310	-45.33	-41.78
S-6682	1145	-52.21	-49.11
LSD (0.05)	285.1		

Table: 10 Results of Advance Guar Fodder Yield Trial

Strains	Fodder yield (t ha⁻¹)	± % over check (BR-21)	± % over check (BR-2017)
S-6710	32.55	3.17	7.25
S-6692	34.62	9.73	14.07
S-6686	32.7	3.65	7.74
BR-21 (Check)	31.55	0.00	3.95
BR-2017 (Check)	30.35	-3.80	0.00
S-6683	23.1	-26.78	-23.89
S-6695	29.9	-5.23	-1.48
S-6682	30.2	-4.28	-0.49
LSD (0.05)	1.89		

The strain S-6710 produced maximum seed yield of 2688 Kg ha⁻¹ and out yielded all the contestants followed by the strain S-6692 (2565 Kg ha⁻¹) than check varieties, BR-21 and BR-2017 which produced 2396 and 2250 Kg ha⁻¹. As for as the fodder yield is concerned, strain S-6692 produced maximum yield of 34.62 t ha⁻¹ followed by S-6686 (32.7 t ha⁻¹) than check varieties BR-21 and BR-2017 which gave 31.55 & 30.35 t ha⁻¹. The three strains S-6710, S-6692 and S-6686 produced higher seed yield than check varieties BR-21 and BR-2017 whereas the same strains S-6710, S-6692 and S-6686 produced higher fodder yield than check varieties. On the basis of good performance, these three strains were selected for further evaluation during the year 2022 in Zonal Varietal Trial. Statistical analysis revealed highly significant differences among the mean values.

1.8 ZONAL GUAR YIELD TRIAL

An experiment consisting of 05 strains including one check was sown at 3 locations at Govt. farms in Punjab i.e. Khanewal, Kalurkot and Bahawalpur. The experiment was laid out according to RCBD having 4 repeats and plot size of 2.7m x 7.2m. The data were recorded for fodder yield during August, 2021 and for seed yield during November, 2021. The results received are summarized as under

Table: 11 Results of Zonal Guar Yield Trial

The data presented in the above table showed that guar strain S-6536 out yielded all the contestants and gave higher seed yield of 2590 Kg ha⁻¹ followed by S-6159 which gave 2325 Kg ha⁻¹ as compared to check variety BR-2017 (1962 Kg ha⁻¹) on the basis of 3 locations average. The

maximum seed yield of 3120 Kg ha⁻¹ was produced by S-6536 at ARS, Khanewal as compared to check (1740 Kg ha⁻¹). As for as the fodder yield is concerned, strain S-6159 produced maximum yield of 32.60 t ha⁻¹ followed by S-6642 (30.40 t ha⁻¹) on the basis of average of three locations than check variety BR-2017 which gave 28.40 t ha⁻¹. The results revealed that three strains S-6536, 6159 & S-6547 performed better than the check variety.

1.9 NATIONAL UNIFORM YIELD TRIAL OF GUAR

Varieties	Seed Yield (Kg ha ⁻¹)			Average
	ARS, KWL	GBRSS Kalurkot	ARS, BWP	
S-6536	3120	2005	2645	2590
S-6159	2340	2290	2345	2325
S-6547	1710	2420	2840	2323
S-6642	2320	1895	2557	2257
BR-2017 (Check)	1740	1890	2255	1962
S-6666	1810	1423	1700	1644
	Fodder Yield (t ha ⁻¹)			
S-6547	-	25.50	33.10	29.30
S-6536	-	24.50	32.50	28.50
S-6159	-	30.90	34.30	32.60
S-6642	-	31.00	29.80	30.40
BR-2017 (Check)	-	26.80	30.00	28.40
S-6666	-	22.20	25.40	23.80

Seed of 02 strains S-6642 & S-6547 of guar was sent to Coordinator (Fodder), NARC, Islamabad to conduct National Uniform Guar Yield Trial. The Coordinator (Fodder) conducted the trial at following sites:

1. AZRI, D.I. Khan
2. AZRI, Bahawalpur
3. AZRI, Bhakkar
4. CRI, Khanpur
5. BARI, Chakwal

The guar strains were given code numbers by Coordinator (Fodder) and were sent to testing sites alongwith sowing plan. At the end of Kharif season, the decoded data on seed and fodder yield were received from the Coordinator (Fodder) which are presented as under:

Table: 12 National Uniform Yield Trial of Guar

Entry	Seed Yield (Kg ha ⁻¹)					
	Chakwal	Bhakkar	Bahawalpur	Khanpur	D.I.Khan	Average
S-6642	2025	1993	1703	892	1033	1529
BR-21 (Check)	2420	1850	1888	952	1013	1624
S-6547	2395	1820	1628	746	1305	1579
CV%	4.12	8.43	10.77	4.82	4.94	
LSD (0.05)	213.11	360.74	424.70	94.22	125.19	
	Fodder Yield (t ha ⁻¹)					
	Chakwal	Bahawalpur	D.I.Khan	-	-	Average
S-6642	12.35	16.03	2.65	-	-	10.34
BR-21 (Check)	16.79	18.20	3.12	-	-	12.70
S-6547	8.89	15.87	3.25	-	-	9.34
CV%	13.64	12.23	12.44			
LSD (0.05)	3.92	4.63	0.85	-	-	

The data on seed yield received from the Coordinator (Fodder) revealed that check variety BR-21 developed by this station produced maximum seed yield of 1624 Kg ha⁻¹ on the basis of average of five locations as compared to the other strains. In case of fodder yield, the check variety produced maximum yield of 12.70 t ha⁻¹ on the basis of average of three locations.

1.10 EVALUATION OF ADVANCE LINES OF GUAR UNDER DROUGHT STRESS CONDITIONS TO ADDRESS THE CLIMATE CHANGE

An experiment consisting of 07 strains including two checks was designed to evaluate high yielding and better adapted varieties/lines of guar under drought stress conditions for areas experiencing water shortage. The experiment was sown on 11.06.2021. The experiment was laid out according to RCBD having 4 repeats and plot size of 2.7m x 7.2m. No irrigation was applied from sowing till harvesting except rowni. However, the rainfall was observed during the months of June (17mm), July (61mm), August (30mm) and September (15mm) at location Cholistan, Bahawalpur and June (28mm), July (101mm), August (11mm) and September (21mm) at location Kalurkot. The experiment was harvested during November, 2021 and seed yield data were recorded which are given as under:

Table: 13 Results of Drought Stress Trial

Entry Name	Seed Yield (Kg ha ⁻¹)
S-6159	1733
S-6547	1698
S-5885	1740
S-6384	1650
S-6161	1423
BR-2017 (Check)	1505
S-6543	1301
BR-21	1498
S-6536	945
LSD(0.05)	122.54

Under drought stress conditions, the variety S-5885 out yielded all the contestants and gave the maximum seed yield of 1740 Kg ha⁻¹ followed by the S-6159 (1733 Kg ha⁻¹), S-6547 (1698 Kg ha⁻¹), S-6384 (1650 Kg ha⁻¹) and S-6161 (1423 Kg ha⁻¹) as compared to check varieties BR-21, BR-2017 which produced 1498 & 1505 Kg ha⁻¹. It is concluded that strains S-5885, S-6159, S-6547, S-6384 and S-6161 can be better adapted to the drought stress conditions and can produce better seed yield. The mean values differed significantly from one another.

2. AGRONOMIC STUDIES

2.1 RESPONSE OF GUAR STRAINS TO NITROGEN, PHOSPHORUS AND POTASH FERTILIZERS FOR SEED YIELD

An experiment comprising of a new guar strain S-6161 was laid out in RCBD with 3 repeats and plot size of 1.8m x 2.7m during Kharif, 2021 to find out the optimum dose of Nitrogen, Phosphorous and Potash fertilizers for new guar strain S-6161 in order to obtain maximum seed yield. The experiment was sown on 22.06.2021 and eight treatments of NPK fertilizers were applied as mentioned in the table below. The similar agronomic practices were adapted for all the treatments throughout growth period. The data on seed yield were recorded and are given as under:

Table: 14 Results of NPK Fertilizer Trial of Guar

Treatments N-P-K	Guar Line S-6161 Seed Yield (Kg ha ⁻¹)
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(Kg ha ⁻¹)	
T1 (00-00-00)	1570
T2 (15-30-45)	1944
T3 (20-40-50)	2317
T4 (25-50-55)	2542
T5 (30-60-60)	2895
T6 (35-70-65)	2826
T7 (40-80-70)	2670
T8 (45-90-75)	2050
LSD (0.05)	330.97

The data revealed that the guar strain S-6161 produced maximum seed yield of 2895 Kg ha⁻¹ at fertilizer doze of NPK 30-60-60 Kg ha⁻¹ i.e. at T5. Further increase or decrease in fertilizer's doses resulted in decrease of seed yield which revealed that optimum doze of NPK positively affected seed yield. Therefore, fertilizer treatment T5 i.e. NPK 30:60:60 Kg ha⁻¹ is most suitable for getting maximum seed yield from guar strain S-6161 which also confirmed previous year's results. Furthermore, statistical analysis revealed significant differences among the mean values.

2.2 EFFECT OF DIFFERENT ROW SPACING ON THE SEED YIELD OF NEW GUAR STRAINS

An experiment consisting of a guar strain S-6161 and a check (BR-2017) was laid out in Spilt Plot Design with 4 repeats and plot size of 1.8m x 2.7m during Kharif, 2021 to investigate the effect of 3 row spacings i.e. 30, 45 and 60 cm on seed yield of guar. The experiment was sown on 22-06-2021. The similar agronomic practices were adapted for all the varieties/treatments throughout growth period. The data on seed yield were recorded and are given as under:

Table: 15 Results of Row Spacing Trial of Guar

Treatments	Row Spacing (cm)	Seed Yield (Kg ha ⁻¹)		
		BR-2017	S-6161	Mean
T1	30	2075	2327	2201
T2	45	2389	2760	2575
T3	60	1981	2553	2267
Mean		2149	2547	
LSD (0.05)	V=149.07	RS=153.27	RS*V=237.93	

The data recorded illustrated that the crop planted on 45cm row spacing gave higher seed yield. The strain S-6161 produced maximum seed yield of 2760 Kg ha⁻¹ and BR-2017

produced 2389 Kg ha⁻¹ while further increase or decrease in row spacing i.e. 30cm & 60 cm resulted in decreased yield which also confirmed previous year's results. Statistical analysis revealed significant differences among the mean values.

2.3 EFFECT OF DIFFERENT SOWING DATES ON THE SEED YIELD OF NEW GUAR STRAINS

An experiment consisting of a guar strain S-6161 and a check (BR-2017) was laid out in Spilt Plot Design with 3 repeats and plot size of 1.8m x 2.7m during Kharif, 2021 to find out the optimum sowing dates for new guar strain to harvest maximum seed yield. The experiment was sown at five different sowing dates i.e. 01/05, 15/05, 01/06, 15/06 & 01/07. The similar agronomic practices were adapted for all the varieties/treatments throughout growth period. The data on seed yield were recorded and are given as under:

Table: 16 Results of Sowing Date Trial of Guar

Treatments	Varieties	
	BR-2017	S-6161
T1 (01/05)	2121	2378
T 2 (15/05)	2500	2850
T 3 (01/06)	2465	2710
T 4 (15/06)	2227	2419
T 5 (01/07)	1770	1978
LSD (0.05)	V= 167.58 SD=270.53	V*SD=378.62

The data revealed that both the varieties S-6161 and check BR-2017 produced maximum seed yield of 2850 Kg ha⁻¹ and 2500 Kg ha⁻¹, respectively, at sowing date of 15th May followed by experiment sown at 1st June. Further increase or decrease in sowing dates resulted in decrease of seed yield. Statistical analysis revealed significant differences among the mean values.

2.4 EFFECT OF SOWING METHODS ON SEED YIELD OF GUAR UNDER IRRIGATED CONDITIONS OF BAHAWALPUR

An experiment comprising of a guar variety (BR-2017) was laid out in RCBD with 3 repeats and plot size of 1.8m x 2.7m during Kharif, 2021 to find out appropriate sowing method in guar crop for achieving maximum seed yield of guar under climate change scenario. The experiment was sown on 22.06.2021 by using four different sowing methods i.e. drill sowing, bed planting, broadcast & ridge sowing. The similar agronomic practices

were adapted for all the treatments throughout growth period. The data on seed yield were recorded and are given as under:

Table: 17 Results of Sowing Method Trial of Guar

Treatments	Seed Yield (Kg ha ⁻¹)
T1 Drill	2370
T2 Bed	2609
T3 Broadcast	1777
T4 Ridge	2199
LSD (0.05)	368.46

The data revealed that guar variety BR-2017 produced maximum seed yield (2609 Kg ha⁻¹) on bed planting followed by drill sowing (2370 Kg ha⁻¹). Therefore, the bed planting and drill sowing are the best sowing methods to obtain optimum seed yield of guar crop. Statistical analysis revealed significant differences among the mean values.

2.5 SEED TREATMENT OF GUAR SEED WITH VARIOUS FUNGICIDES TO CONTROL SEED AND SOIL BORNE DISEASE OF GUAR

An experiment comprising of a guar variety (BR-2017) was laid out in RCBD with 3 repeats and plot size of 1.8m x 2.7m during Kharif, 2021 to find out appropriate fungicides and their time of application for control of fungal diseases (Fusarium wilt, bacterial blight, alternaria leaf spot, root rot) in guar crop for maximum seed yield of guar under varying climatic conditions. The experiment was sown on 22.06.2021 and five treatments were applied as per plan given below in table 18. After starting application each fungicide was applied 3 times with 10 days' interval. The data recorded on seed yield and wilting %age are given as under:

Table: 18 Results of Seed Treatment of Guar

Treatments	Seed Yield (Kg ha ⁻¹)	Wilting %age
T1 (Control)	1862	7
T2 (Imdacloprid+ Tubaconazol)	2358	4
T3 (Thiophenate Methyl)	2048	5
T4 (Mencozeb)	2240	4
T5 (Fostyle Aluminum)	2728	1
LSD (0.05)	141.74	

The results revealed that Fungicide Fostyle Aluminum @2g/Kg performed better than all other fungicides as 1 % plant's wilting was observed as compared to control (7.0%)

wilting) where no fungicide was applied. Furthermore, the fungicide Imdacloprid+ Tubeconazol also provided good results when applied @ 2 ml/Kg as 4.0 %, plant's wilting was observed respectively. Maximum seed yield (2728 kg ha⁻¹) was obtained in T5 when Fostyle Aluminum @2g/Kg was applied. On the other hand, maximum plant's wilting 7.0% was observed in T₁ when no fungicide applied followed by T₃ (Thiophenate Methyl) as 5% wilting.

2.6 EFFECT OF NUMBER OF CUTTINGS ON THE SEED PRODUCTION OF BERSEEM UNDER CLIMATIC CONDITIONS OF BAHAWALPUR.

An experiment comprising of a Berseem variety (Berseem Agaitti) was laid out according to RCBD with 3 replications and plot size of 3m x 6m to find out optimum number of cuttings to obtain higher seed production of Berseem under climatic conditions of Bahawalpur. The experiment was sown on 19-11-2021 and five treatments were applied as given in table 29. The data recorded on seed yield is given as under:

Table: 29 Effect of number of cuttings on the seed production of Berseem

Treatments	Seed Yield (Kg ha⁻¹)
T1 (No cut)	275
T2 (single cut)	328
T3 (two cuts)	485
T4 (three cuts)	390
T5 (four cuts)	299
LSD (0.05)	110.68

The data showed that maximum seed yield of 485 Kg ha⁻¹ was obtained on two cutting (T3) of the crop followed by seed yield (390 Kg ha⁻¹) on three cutting (T4) as compared to seed yield (275 Kg ha⁻¹) on control (T1) where no cutting was done. Further increase or decrease in number of cutting was resulted in decrease of seed yield of Berseem. Therefore, it is most suitable that crop should be retained for seed purpose after two cuttings of fodder to get maximum seed yield.

2.7 NITROGEN, PHOSPHOROUS AND POTASSIUM REQUIREMENT OF BERSEEM FOR SEED PRODUCTION

An experiment comprising of a Berseem variety (Punjab Berseem) was laid out according to RCBD with 3 replications and plot size of 3m x 6m to find out optimum dose of phosphorous and potassium for higher seed production of Berseem under climatic conditions

of Bahawalpur. The experiment was sown on 19.11.2021 and twelve treatments were applied as given in table 24. The data recorded on seed yield is given as under:

Table: 30 Results of nitrogen, phosphorous and potassium requirement of Berseem

Treatments	N (Kg ha ⁻¹)	P ₂ O ₅ (Kg ha ⁻¹)	K ₂ O (Kg ha ⁻¹)	Seed Yield (Kg ha ⁻¹)
T1	0	0	0	342
T 2	25	60	10	493
T 3	30	70	20	656
T 4	35	80	30	538
T 5	40	90	40	456
LSD (0.05)				95.71

The data revealed that Berseem crop produced maximum seed yield of 656 Kg ha⁻¹ at fertilizer doze (T3) of N.P.K. 30.70.20 Kg ha⁻¹ followed by seed yield (538 Kg ha⁻¹) at fertilizer doze (T4) of N.P.K. 35.80.30 Kg ha⁻¹. Further increase or decrease in fertilizer's doses resulted in decrease of seed yield which revealed that optimum doze of nitrogen, phosphorous and potash positively affected seed yield. Therefore, fertilizer treatment T3 i.e. NPK 30.70.20 Kg ha⁻¹ is most suitable for getting maximum seed yield from Berseem crop.

3. ENTOMOLOGICAL STUDIES

3.1 SCREENING OF GUAR GENOTYPES AGAINST INSECT PESTS

The seed of 05 strains of guar including one check was provided to the Entomologist, RARI, Bahawalpur during Kharif, 2021 for their screening against insect pests. The experiment was laid out according to RCBD with 3 replications and plot size of 2.7m x 7.2 m. The data on insect pest recorded by the Entomologist, RARI, Bahawalpur are given as under:

Table: 19 Response of Guar Genotypes to Insect Pests

Entries	Average Jassid/Leaf	Average W.F./Leaf
S-6547	0.40	2.55
S-6536	0.50	3.66
S-6159	0.45	4.20
S-6642	0.44	3.70
S-6666	0.80	4.80
BR-2017 (Check)	0.55	3.80

Entries	Bacterial blight and Alternaria blight were observed and plant reaction was as under	
	Bacterial blight	Alternaria blight
S-6547	Resistant	Moderately Resistant
S-6536	Moderately Susceptible	Susceptible
S-6159	Moderately Resistant	Moderately Resistant
S-6642	Moderately Resistant	Resistant
S-6666	Resistant	Moderately Susceptible
BR-2017 (Check)	Moderately Resistant	Moderately Resistant

The data received from the Entomologist revealed that only attack of white fly and jassid was observed. The strain S-6547 had minimum attack of jassid (0.40 leaf^{-1}) followed by S-6642 (0.44 leaf^{-1}) whereas S-6666 had the highest infestation of jassid (0.80 leaf^{-1}). However, the attack was below ETL on all strains. In case of white fly, again the strain S-6547 had minimum infestation of whitefly (2.55 leaf^{-1}) followed by the strain S-6642 (3.70 leaf^{-1}) while S-6666 had maximum attack of white fly (4.80 leaf^{-1}). The data shows better performance of all the strains against insect pest as attack is below ETL on all entries. The statistical analysis of the data revealed highly significant differences among the guar strains.

4. PATHOLOGICAL STUDIES

4.1 SCREENING OF GUAR STRAINS AGAINST DISEASES

The seed of 05 strains of guar along with one check was provided to the Plant Pathologist, RARI, Bahawalpur during Kharif, 2021 for their screening against diseases. The experiment was laid out according to RCBD with 3 replications and plot size of 2.7m x 7.2 m. The following results were reported by the Plant Pathologist, RARI, Bahawalpur:

Table: 20 Results of Screening of Guar Genotypes against Diseases

The Plant Pathologist, RARI, Bahawalpur reported that incidence of bacterial blight and alternaria blight was observed under Bahawalpur conditions. The results showed that S-6547 and S-6666 were resistant to bacterial blight and S-6159, S-6642 and BR-2017 were moderately resistant whereas S-6536 was moderately susceptible to this disease. In case of alternaria blight, the strain S-6642 was found resistant while S-6547, S-6159 including check were moderately resistant and S-6536 which was found susceptible.

5. ADAPTABILITY STUDIES

5.1 ADAPTABILITY GREEN FODDER YIELD TRIAL ON PEARL MILLET

This trial was received from the Chief Scientist, Fodder Research Institute, Sargodha during Kharif, 2021. The objective of the trial was to test the advanced varieties/lines of pearl millet in different ecological zones of the Punjab for their fodder yield and adaptability. The trial was consisted of 08 coded varieties of pearl millet and was laid out according to RCBD with 3 replications and plot size of 1.8m x 5m and was sown on 19.07.2021. The data on fodder yield were recorded at the time of 50% flowering. The data recorded on green fodder yield are given as under:

Table: 21 Results of Adaptability Trial of Pearl Millet

Entry	GFY (t ha ⁻¹)
W-Raj	62.41
WATNI	61.29
RAJ	61.67
Copmpsite-5	48.21
Y-84	56.06
RSBK-948	51.95
SGD-Bajra 2011	53.82
S-2017	49.33
LSD (0.05)	17.57

The data were sent to the Chief Scientist, Fodder Research Institute, Sargodha.

5.2 ADAPTABILITY GREEN FODDER YIELD TRIAL OF MAIZE

This trial was received from the Chief Scientist, Fodder Research Institute, Sargodha. The trial consisted of 07 coded varieties of maize and was laid out according to RCBD with 3 replications and plot size of 1.8m x 5m and was sown on 19.07.2021. The data recorded on green fodder yield at the time of 50% flowering are given as under:

Table: 22 Results of Adaptability Green Fodder Yield Trial of Maize

Entry	GFY (t ha ⁻¹)
MS-02-2019	20.93
MS-08-2019	22.42
Supper green maize Check	26.91
MS-03-2019	30.65
SGD-2002 (Check)	28.03
MS-05-2019	26.91
COMPOSITE-II	21.67

LSD (0.05)	14.13
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The data were sent to the Chief Scientist, Fodder Research Institute, Sargodha.

5.3 ADAPTABILITY GREEN FODDER YIELD TRIAL OF SORGHUM

An experiment consisting of 08 coded strains of sorghum was received from the Chief Scientist, Fodder Research Institute, Sargodha. Trial was laid out according to RCBD with 3 replications and plot size of 1.8m x 5m and was sown on 19.07.2021. The data recorded on green fodder yield at the time of 50% flowering are given as under:

Table: 23 Results of Adaptability Trial of Sorghum

Entry	GFY (t ha-1)
9802	34.01
74702	46.34
6197	33.64
F-01-19	32.51
OSAF	32.52
PAK SORGHUM (Check)	34.76
F-01-20	31.77
F-02-20	41.11
LSD (0.05)	10.09

The data were sent to the Chief Scientist, Fodder Research Institute, Sargodha

5.4 HYBRIDIZATION OF OATS AND STUDY OF FILIAL GENERATIONS

To combat biotic (insect pests/ diseases), abiotic stresses (drought) and to create genetic variability and selection of desirable recombinants from different generation of oats, hybridization programme was undertaken by crossing different oats genotypes. The following 10 fresh crosses were attempted:

Table 24: Hybridization of Oats

Cross #	Name of Cross	No. of spikes crossed	No. of successful Spikes
1.	S-2000 X SGD-2001	70	1
2.	SGD-2001 X S-2000	80	-
3.	FRI-2002 X SGD-2001	100	2
4.	SGD-2001 X FRI-2002	90	1
5.	S-2000 X NO.668	60	-
6.	NO.668 X S-2000	90	-
7.	SGD-2001 X FRI-2003	80	-
8.	FRI-2003 X SGD-2001	60	-
9.	SGD-2001 X NO.668	80	2
10.	NO.668 X SGD-2001	90	1

F₀ seed was harvested for growing F₁ during Rabi, 2022-23.

Furthermore, following generations were maintained during Rabi, 2021-22

Generation	Parental Crosses/progenies studied	Crosses/plants/ progenies selected
F ₁	4 (Crosses)	4 (Crosses)
F ₂	3 (Crosses)	15 (Plants)

5.5 ADAPTABILITY GREEN FODDER YIELD TRIAL OF OATS

This trial was received from the Chief Scientist, Fodder Research Institute, Sargodha during Rabi, 2021-22. The trial consisted of 10 coded varieties of oats. It was laid out according to RCBD with 3 replications and plot size of 2.4m x 4m and was sown on 23.11.2021. The data on green fodder yield were recorded at the time of 50% flowering and are given as under:

Table: 25 Results of Adaptability Green Fodder Yield Trial of Oats

Varieties	Green Fodder Yield (t ha ⁻¹)
P1	52.9
P2	67.2
P3	61.3
P4	55.3
P5	63.8
P6	58.3
P7	52.4
P8	59.8
P9	51.5
P10	66.5
LSD (0.05)	4.88

The data recorded were sent to the Chief Scientist, Fodder Research Institute, Sargodha.

5.6 ADVANCE GREEN FODDER YIELD TRIAL OF OATS

This trial was received from the Chief Scientist, Fodder Research Institute, Sargodha during Rabi, 2021-22. The trial consisted of 10 coded varieties of oats. It was laid out according to RCBD with 3 replications and plot size of 2.4m x 4m and was sown on 23.11.2021. The data on green fodder yield were recorded at the time of 50% flowering and are given as under:

Table: 26 Results of Advance Green Fodder Yield Trial of Oats

Varieties	Green Fodder Yield (t ha ⁻¹)
P1	58.6
P2	74.6
P3	63.5

P4	72.0
P5	53.0
P6	59.6
P7	79.3
P8	51.5
P9	68.9
P10	65.8
LSD (0.05)	6.68

The data recorded were sent to the Chief Scientist, Fodder Research Institute, Sargodha.

5.7 ADVANCE GREEN FODDER YIELD TRIAL ON BERSEEM

This trial was received from the Chief Scientist, Fodder Research Institute, Sargodha. The trial consisted of 08 coded entries (A-H) of Berseem and was laid out according to RCBD with 3 replications and plot size of 3m x 5m. The experiment was sown on 23.11.2021. The data on fodder yield were recorded and each entry was harvested for four times. The compiled data are given as under:

Table: 27 Results of Adaptability Fodder Yield Trial on Berseem

Varieties	Green Fodder Yield (t ha⁻¹)
A	75.37
B	69.37
C	64.48
D	67.14
E	61.36
F	73.59
G	70.26
H	83.82
LSD (0.05)	

The compiled/coded data were sent to the Chief Scientist, Fodder Research Institute, Sargodha.



Figure 05: Adaptability Trial on Berseem (2021-22)

5.8 NATIONAL UNIFORM FODDER YIELD TRIAL ON BERSEEM

An experiment consisting of 16 entries (1-16) of Berseem was received from the Coordinator (Fodder), PARC, Islamabad. Trial was laid out according to RCBD with 3 replications and plot size of 3m x 5m and was sown on 23.11.2021. The data on fodder yield were recorded and each entry was harvested for four times. The compiled data are given as under:

Table: 28 Results of National Uniform Fodder Yield Trial on Berseem

Entries No.	Fodder Yield (t ha⁻¹)
1	76.32
2	74.58
3	75.02
4	77.63
5	88.07
6	72.41
7	77.41
8	73.50
9	75.02
10	68.50
11	76.32
12	74.58
13	79.59
14	72.19
15	75.67
16	76.32

The coded data were sent to the Coordinator (Fodder), PARC, Islamabad.

5.9 NATIONAL UNIFORM FODDER YIELD TRIAL ON LUCERNE

An experiment consisting of 12 entries of Lucerne was received from the Coordinator (Fodder), PARC, Islamabad. Trial was laid out according to RCBD with 3 replications and plot size of 1.5m x 5m and was sown on 23.11.2021. The data on fodder yield were recorded. The data on fodder yield were recorded and each entry was harvested for four times. The compiled data are given as under:

Table: 31 National Uniform Fodder Yield Trial on Lucerne

Varieties	Fodder Yield (t ha ⁻¹)
1	52.5
2	48.4
3	53.0
4	50.4
5	37.1
6	54.7
7	51.4
8	56.6
9	55.8
10	43.9
11	53.3
12	52.1

The coded data were sent to the Coordinator (Fodder), PARC, Islamabad.

6. SEED PRODUCTION OF FODDER CROPS

This research station is producing the breeder nucleus seed (BNS) and pre-basic seed of fodder crops like guar, lucerne, berseem, oats and sorghum to meet the requirement of seed companies/growers/farmers of the southern Punjab. During the year 2021-22, the following quantity of seed was produced:

Table: 32 Seed production of different fodder crop

Crop	Variety	BNS (kg)	Pre-basic (kg)	Total
Guar	BR-2017	25	950	975
	BR-21	15	250	265
Sorghum	Sorghum-2011	-	2020	2020
Berseem	Berseem Agaitti	-	550	550
	Punjab Berseem	-	700	700
Lucerne	Sargodha-Lucerne 2002	-	500	500
Oats	Super Green	-	500	500
	Sgd. Oats -2002	-	700	700