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Evaluation of spring bread wheat lines/ varieties in international observation nurseries and yield trials in moderat region of Iran

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This study centered primarily on an assessment of the genotypes of spring bread, chosen from the collaborative Iran/CIMMIT campaign, leveraging various statistical methods. The assessment of susceptibility to sickness, dwelling and shuttering was performed in order to choose the fresh spring bread varieties with strong yields relative to commonly cultivated types. Valuability confirmation of plant genetic services obtained from Foreign Institutions for cross-breeding use and successful incorporation with four sets of international terrariums throughout sample locations by separate trials as a repeated output study or research greenhouse evaluation. Fifty inputs were investigated during the initial analysis using the alpha lattice framework and two replicates and six desired genpe species were chosen for further investigation. Thirty inputs have been analyzed in a subsequent analysis by randomizing the arrangement of the compete blocks with three replications and six higher lines. 287 and 86 inputs were analyzed as observing terrariums in the third and fourth collections, and 15 and 11 inputs were chosen separately for further examinations. Specified genotypes are submitted to the local wheat production experiment for further examination.

Keywords: Spring Wheat, International Nurseries Yield Trial

INTRODUCTION

Auto-sufficiency in wheat development is an objective in most nations around the world and farmers may play a key role in achieving this by launching or the development of innovative, desired crop wheat (Khayatnezhad and Gholamin, 2021a, Gholamin and Khayatnezhad, 2020b, Karasakal et al. 2020a). Of course, there is a requisition to increase the gene pool of plants in high variety of fostering resources that are accessible from the farming system of other nations (Khayatnezhad and Gholamin, 2020b, Si et al. 2020). DNA molecules are exchanged by crops worldwide between producers and regions after the beginning of last year. For instance, the Russian Monontes exported the first shipment of durum wheat to

America in 1873 (Alayi et al. 2020, Arjaghi et al. 2021, Khayatnezhad, 2012, Li et al. 2021). Currently this is not simple and often impractical due to the lockdown position, but it is important to collect the DNA of wheat through foreign terrariums from the Global Maize and Wheat Reforming Facility (CIMMYT) and the International Center for Agricultural Research in the Dry Areas (ICARDA). Background of global terrariums is fascinating. In the United States and Canada, in the 1950s a stalk corrosion (*Puccinia graminis*) outbreak ravaged farmlands (Gholamin and Khayatnezhad, 2020c, Aletor, 2021). In both 1953 and 1954, approximately 60% and 75% of wheat production in the US were demolished. A modern pathogenic species named 15B was the origin of the injury, and was then immune to all genes in

established commercial variants (Khayatnezhad and Nasehi, 2021, Jia et al. 2020, Barth, 2021). Throughout Latin America, too, a parallel race has grown broadly. The Department of Agriculture asked the United States of America to adhere powers to measure 1,000 of the picked wheat genotypes from the world's weight range, for 7 countries (Mexico, Colombia, Ecuador, Peru, Chile, Argentina, Canada) It was the initial worldwide stem corrosion experiment and the findings of the 15B breed have surpassed predictions and alternative origins of tolerance for the 15B breed have been discovered (Karasakal et al. 2020b, Huang et al.2021, Gholamin and Khayatnezhad, 2020d). The establishment of an infrastructure to assess lines, suggestions and their dissemination in developing nations was another outcome of this research.

In 1960, a specialized study was conducted across 12 countries from Canada to Argentina in the initial multinational spring wheat greenhouse (Zhu et al. 2021, Khayatnezhad and Gholamin, 2021a, Huang et al. 2021, Ren and Khayatnezhad, 2021). Because of expressed interest of other wheat-producing countries around the world, in 1964 CIMMYT created the International Spring Wheat Yield Nursery (ISWYN) that included lines adapted to high and low latitudes; in 2001, the International Wheat Improvement Network (IWIN that acts like a diplomatic corp. for the CIMMYT Wheat Program) prepared 2,766 sets of 40 different bread wheat, durum wheat, triticale, and barley nurseries (Khayatnezhad and Gholamin, 2012a, Gholamin and Khayatnezhad, 2021, Gholamin and Khayatnezhad, 2020a, Sun et al. 2021, Ren and Khayatnezhad, 2021).The specimens have been submitted to 619 wheat academic scholars from 117 nations. The test results was then sent to CIMMYT, cataloged and evaluated by the global wheat group and made accessible (Yin et al. 2021, Sun and Khayatnezhad, 2021, Khayatnezhad and Gholamin, 2021b, Gholamin and Khayatnezhad, 2021). Absolutely, global greenhouses (IWWIP) may report annually and the participating nations may use other websites in other countries to choose the content more precisely (Khayatnezhad and Nasehi, 2021, Sun et al. 2021, Bi et al. 2021). Currently 120 countries are receiving supplies, and the final rightfuls are producers receiving better, modern high-yielding strains (Gholamin and Khayatnezhad, 2021, Sun et al. 2021, Esmailzadeh et al. 2020, Farhadi et al. 2020, Hewitt, 2021).

International collaboration on germplasms is

not just helpful but also necessary for potential human food standards. Likewise, according to the relevance of wheat throughout Iran as basic necessities and principal plant of the country cultivating more than 50 % of agricultural area, a collaborative curriculum with CIMMYT proceeded in prior seasons and some marketing wheat varieties, including Naz, Alborz, Falat, Atrak, Chamran..., emerged and chosen from global terrariums. This current research was performed to assess, scan breeding content from some foreign CIMMYT-patients and CIMMYT-ICARDA collaborative system for block usage as gene origins or inputs for sophisticated production tests through crossing sites

MATERIALS AND METHODS

Land experiments were performed through the use of four sets of genetic tools obtained from foreign centres (CIMMYT and ICARDA). The studies carried out independently are as follows:

Table 1: ANOVA of ESWYT yield data

Source of variation	DF	MS
Replication	1	2.9**
Blocks(ADJ)	18	0.53**
Genotype	49	0.67**
Teratment (ADJ)	49	0.53**
Error	31	0.19
CV		4.6

*, **: significant difference at 5% and 1% level respectively.

Elite Spring Wheat Yield Trial (ESWYT)

This evaluation was done out at Karaj station, Tehran with 50 records, namely regional inspection with a pattern and two iterations of the alpha lattices. As a foundation of this site was a formulation from 120-90-50 of N-P-K fertilizer. Plot size was 3.6 m² (3 × 1.2 m) and consisted of 6 rows with 20 cm interrow spaces. Seeding was carried out with emprical farming and drainage, as prescribed .The results were consistent with the findings of other studies (Khayatnezhad and Gholamin, 2012b, Huma et al. 2021).

Elite Bread Wheat Yield Trial (EBWYT)

This test was conducted by a randomized compact block design (RCBD) with three iterations throughout Zarghan Experimental Site, Fars province. Plot size was 3.6 m² (3 × 1.2 m) and consisted of 6 rows with 20 cm interrow spaces. Plantation and drainage are conducted according to the specifications of a product.

Table 2: Average evaluation of certain physiological details for chosen lines throughout the ESWYT examination

Entry No.	Pedigree	DHE	PLH (cm)	TKW (gr)	YLD (t/ha)
1	LOCAL CHECK:Pishtaz	115	100	40	10.498
16	PASTOR/3/VORONA/CNO79//KAUZ	117	105	39	10.313
17	CNDO/R143//ENTE/MEXI_2/3/AEGILOPS SQUARROSA (TAUS)/4/...	113	100	40	10.887
21	MINO	113	105	38	10.345
29	VEE#8//JUP/BJY/3/F3.71/TRM/4/2 *WEAVER/5/HAHN/2*WEAVER/6/WEAVER	116	95	45	10.293
30	CHUM18/7*BCN	113	95	36	10.413
31	KAUZ//ALTAR 84/AOS/3/PASTOR	115	105	36	10.526
	LSD 5%=1.041, LSD 1%=1.4 t/ha t/ha				

DHE : days to heading, PLH: plant height, TKW:1000 kernel weight

Table 3: ANOVA of EBWYT yield data

Source of variation	DF	MS
Replication	2	0.314 ^{ns}
Genotype	29	0.319 [*]
Error	58	0.191
CV		14

^{*}, ^{ns}: significant difference at 5% and 1% level respectively.

Table 4: Few area documents and performance of EBWYT inputs

Entry No.	Pedigree	YR	DHE	DMA	PLH (cm)	Yield (t/ha)
1	Local Check : Pishtaz	10S	126	170	90	6.840
2	Local Check : Marvdasht	10S	124	169	82	5.146
3	Pfau/Wenver*2//Kiritati	10S	127	169	92	6.535
4	Pfau/Weaver/3/Weaver/Oci/Borl 95	10MR	126	170	90	6.139
5	Up2338*2/Sni/Trap#1/3/Kauz+2//Kauz	5 MS	126	169	87	5.819
6	Wbll1*1/Kkts	R	125	169	91	6.535
7	Wbll 1*2/Chapio	R	126	170	93	6.556
8	Wbll 1*2/Tukuru	10S	127	170	100	5.465
9	Wbll 1*2/4/Yaco/Pbw65/3/Kauz*2/Trap//Kauz	R	127	169	94	5.500
10	Wbll 1*2/Huruku	10MR	125	169	88	5.764
11	Well 1*2/Vivisi	R	126	169	92	5.694
12	Wbll4*/Kukuna/Wbll 1	10S	133	173	80	5.715
13	Fret2/Tukuna//Fret2	O	124	171	66	6.076
14	Wbll1*2/Kuluna	30S	125	171	80	6.674
15 *	Kauz//Altar 84/Aos/3/Milan/Kauz/4/Huites	R	125	171	77	7.125
16 *	Reh/Hare//2*Bcn/3/Croc-1/Ae.Squarrosa (213)//...	R	125	170	86	7.417
17	Cal/Nh//H567.71/3/Seri/4/Cal/Nh/	O	126	171	93	6.347
18 *	Oasis/Skauz//4*Bcn*2/3/Pastor	O	127	170	96	7.681
19	Nac/Th/AC//3*Pvn/3/Mirlo/Buc/4/2*Pastor	O	128	170	90	6.757
20	Kauz/Pastor//Pbw343	O	124	169	87	6.076
21	Tukuru//Bav92/Rayon	5MR	125	170	85	6.729
22 *	Seri.1B*2/3/Kauz*2/Bow//Kauz	O	126	170	83	6.861
23	Seri.1B//Kauz/Hevo/3/Amad	5S	127	169	92	6.722
24	Attila*2/Star	20S	126	170	84	7.535
25	Attila*2/Pbw 65	10S	127	170	95	7.674
26 *	Pbw65/2*Pastor	R	127	171	90	7.090
27 *	Milan/Kauz//Pastor/3/Pastor	10MS	128	171	100	7.090
28	RI6043/4*Nac//2*Pastor	10S	126	169	102	6.806
29	Milan/Kauz//Prinia/3/Babax	R	129	171	95	5.882
30	Chen/Ae.Sq//2*Opata/3/Wbll1	5S	126	169	87	6.368

YR: yellow rust, S: susceptible, MS: mid susceptible, MR: mid resistant, R: resistant, O: not observed, DHE: days to heading, DMA: days to maturity, PLH: Plant height, *: selected.

The results were consistent with the findings of other studies (Gholamin and Khayatnezhad, 2012, Kabir et al. 2021, Xu et al. 2021, Ma et al. 2021).

International Spring Wheat Screening Nursery (ISWSN)

The terrarium actually occurred at Karaj station, Tehran, and the Zarghan test facility, Fars.. The test consisted of 86 entries (including local checks) and Four improved bread wheat cultivars including Marvdasht, Pishtaz, Shiraz and Bahar were used as checks; each one planted after every 20 entries (plot No. 20, 40, 60, 80). Plot size was 1.2 m² (0.6 × 1.2 m) and consisted of 2 rows with 30 cm interrow spaces. All locations were planted manually and irrigated to provide ground space, as desired.

International Bread Wheat Screening Nursery (IBWSN)

The terrarium contained 278 inputs, including regional tests at Karaj and Eslamabad platform, Kermanshah.. Four improved bread wheat cultivars, Marvdasht, Pishtaz, Shiraz and Bahar were used as checks and each one planted after every 20 entries. Plot size was 1.2 m² (0.6 × 1.2 m) and consisted of 2 rows with 30 cm interrow spaces. Gardening was carried out manually at two locations and drainage was conducted as required. The results were consistent with the findings of other studies (Khayatnezhad and Gholamin, 2020a, Radmanesh, 2021, Huang et al. 2021).

Disease scoring

In certain places of the nation, assessment of corrugated corrosion, foliage soot and traditional color was performed. Modified Cobb's scale (Muhibbu-din, 2020) and (Fataei, 2017, Ghomi Avili and Makaremi, 2020) were used for rust scoring and other diseases respectively. The results were consistent with the findings of other studies (Khayatnezhad and Gholamin, 2021b, Rodriguez, 2021).

Data collecting

During spring, herb controls and tolerance to disease reports, shelter, running and development, plant height, core hue and fracturing were performed.

Statistical analysis

The descriptive statistics for the assessment of inputs in the ESWYT and EBWYT experiments

was repeated by the ALPHA and SAS sets, however the non-parametric rating approach has been used for experimental terrariums without repetition (ISWSN and IBWSN) centered on each position believed to be one iteration.

RESULTS AND DISCUSSION

ESWYT

The sequential differences between genotypes were illustrated based on Analysis of variance (ANOVA) findings (table 1). Input No. 17 was the largest yield (table 2). For further consideration, six entrants with good field efficiency in sophisticated production assessments have been chosen according to the field documents and the results of ANOVA. Entry count, genealogy, production and some biological features of the chosen inputs are provided in Table 2.

EBWYT

Around 5 % level there were substantial variations between genotypes (table 3). Input No is the most efficient factor to generate the maximum production (8.671 t/ha). Concerning more requirements, six excellent and strong production inputs were chosen with the strongest field reports and agronomic characteristics. Table 4 display entry count, genealogy, production and certain agronomic characteristics of specified inputs. Picked lines labeled with a star in table 4.

ISWSN

The performance of both sites and findings shown in table 5 were classified. The strongest production of wheat across area is observed in input 67 (9,354 t/ha). The maximum rating obtained in inputs 82 and 10 throughout Karaj and Zarghan (12.598 t/ha and 7.583 t/ha). Based on the field results of the inputs, gathered information about agronomic characteristics mostly during cropping period, disease resistance and classification outcome, eventually, eleven inputs were chosen for further review (table 5)

IBWSN

Depending on the output rating of the region turnover, the data are summarized in Table 6. Highest grain yield over two locations (12.700 t/ha) produced by entry 80. Highest yield in Karaj and Kermanshah (13.250 and 14.264 t/ha) produced by entries 80 and 256 respectively.

Table 5: Rating of performance for ISWSN sampling sites

TRT	MEAN_M	STD_M	CV_M	MEAN_R	STD_R	CV_R	SUM_R
67	9.354	3.919	41.891	4.250	3.182	74.870	8.5
21	8.875	3.594	40.501	12.250	2.475	20.203	24.5
5	8.667	3.418	39.435	17.000	2.121	12.478	34
7	8.583	2.475	28.834	17.750	20.860	117.519	35.5
81	8.708	3.712	42.629	18.000	7.071	39.284	36
6	8.500	3.771	44.368	21.250	10.253	48.250	42.5
10	8.758	1.662	18.973	24.000	32.527	135.529	48
4	8.313	2.563	30.836	24.250	22.274	91.851	48.5
74	8.229	3.153	38.309	27.000	3.536	13.095	54
44	8.146	3.624	44.488	29.750	7.425	24.957	59.5
11	8.125	2.652	32.636	31.250	18.031	57.700	62.5

TRT: Entry number, MEAN_M: Mean yield of genotype, STD_M: Standard deviation of yield; CV_M: Coefficient variation of yield, MEAN_R: Mean of Rank, STD_R: Standard deviation of rank, CV_R: Coefficient variation of rank, SUM_R: Sum of ranks.

Table 6: The finding of turnover across several areas regarding IBWSN analysis

TRT	MEAN_M	STD_M	CV_M	MEAN_R	STD_R	CV_R	SUM_R
263	12.079	0.583	4.824	8.750	1.768	20.203	17.5
203	12.019	1.676	13.949	13.750	13.789	100.281	27.5
266	11.846	1.550	13.087	15.750	15.203	96.526	31.5
104	11.444	0.864	7.549	21.750	2.475	11.379	43.5
24	11.393	1.146	10.054	23.500	14.849	63.188	47
224	11.617	1.874	16.133	28.500	31.820	111.648	57
111	11.286	0.287	2.543	28.750	18.031	62.717	57.5
270	11.188	0.855	7.645	31.000	4.243	13.686	62
247	11.287	0.065	0.575	33.500	31.820	94.984	67
239	11.116	0.576	5.184	34.250	8.132	23.742	68.5
268	11.250	1.532	13.618	35.000	33.941	96.975	70
28	11.091	0.541	4.876	35.750	10.253	28.680	71.5
76	11.087	0.358	3.232	37.250	19.445	52.203	74.5
45	11.136	1.370	12.306	38.500	28.991	75.302	77
117	11.117	1.226	11.025	38.500	21.920	56.936	77

TRT: Entry number, MEAN_M: Mean yield of genotype, STD_M: Standard deviation of yield; CV_M: Coefficient variation of yield, MEAN_R: Mean of Rank, STD_R: Standard deviation of rank, CV_R: Coefficient variation of rank, SUM_R: Sum of ranks.

Based on the field output of the inputs, reported evidence about agronomic characteristics throughout the cropping period, disease tolerance and classification scores, fifteen inputs were eventually chosen for further examination (table 6).

CONCLUSION

Based on Results Confirmation of the evaluation of plant genetic services obtained from external media for successful use of the breed and combination with four sets of international terrariums in the sample locations by separate

experiments as a replication study or research greenhouse evaluation. Fifty inputs were examined during the initial analysis using the alpha network framework and two replicates and six species species were selected for further study.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

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AUTHOR CONTRIBUTIONS

Mohammad Mahdi Abadi conducted, planned, Analyzed the data, wrote manuscript and interpreted the results and involved in manuscript preparation. All authors read and approved the final version.

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