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AGRONOMIC SEED PRODUCTION AND OIL QUALITY EVALUATION OF VARIOUS RAPESEED GENOTYPES GROWN UNDER SEMI-ARID CLIMATIC CONDITION

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ABSTRACT

Rapeseed is important oil seed crop of the world. Increase in the demand of edible oil due to the ever-increasing population has threatened the sufficient availability of edible oil. For this purpose, a two-year field experiment was carried out at experimental farm of Bahauddin Zakariya University, Bahadur Sub-Campus Layyah-Pakistan for characterization of rapeseed germplasm in production and seed oil quality semi-arid climatic condition. Twenty rapeseed genotypes *viz.,* Holya-401, Faisal canola, AARI-Canola, Hop-09, RBN-04722, Panjab Sarsoon, RBN-11049, Mulki, PARC-Canola hybrid, Pakola, Canola Raya, Con-II, 19-H, Durr-e-Nifa, RBN-03046, Shiralee, Dunckled, Bulbul, Nifa Gold and Abasin-95 were used in experiment and repeated for two consecutive years 2018-19 and 2019-20. Statistical analysis showed significant ($p<0.05$) differences among rapeseed genotypes in relation to their morphological attributes and yield contributing traits. Results revealed that genotype 'Dunkled' produced the higher number of seeds per siliqua per plant, biological and seed yield while higher oil seed quality was observed in genotype 'Nifa-Gold'. To conclude genotype 'Dunckled' and 'Nifa-Gold' have ontogenically being more plastic performed under semi-arid climate conditions. Variability in rapeseed genotypes may be a good approach for breeding programs to obtain good production and oil quality under various environmental conditions.

Keywords: Rapeseed genotypes, oil quality, seed yield, semi-arid region

INTRODUCTION

Canola are important oilseed crops belong to rapeseed family and have an origin from a cross between closely related to diploid species of *B. oleracea* and *B. rapa* and *B. juncea* that are cultivated in different regions of the world (Cardone et al., 2003; Licata et al., 2017; Paula et al., 2019; Seepaul et al., 2021). Canola crop is mainly used for oil extraction and human products which are edible and used in daily routine products like cooking oil, margarine, salad dressing and shortening (Canola Council of Canada, 2019). Low saturated fatty acids are present in canola so its demand as a good oil producer is primarily important moreover, vitamin E, and K, and high omega-3 fatty acids are also present in it in moderate ranges. Other than human consumption in edible market of canola, its oil meal after oil extraction is used for livestock feed and can also be used to produce biodiesel fuel, bio lubricants and bioplastics (Canola Council of Canada, 2019).

Pakistan has been facing a persistent scarcity of edible oil; a huge amount of edible oil is imported to bridge up the difference among domestic production and utilization which results in heavy import bills. Moreover, due to increasing demand of edible oil coupled with stagnant production has raised the process of edible oil throughout the world. Therefore, it is a dire need to increase the production of edible oil which can meet the national needs and save import bills. rapeseed genotypes and second among oilseed crops of Pakistan and can be profitably cultivated in numerous areas of the country, but production is much less than potential due to wrong selection of genotype, poor agronomic management and biotic and abiotic stresses (Mustafa et al., 2018; Safdari-Monfared et al., 2020). With a thorough understanding of the physiological mechanisms involved in adaptation of rapeseed genotypes to a specific region, genotypes with maximum potential can be achieved.

There are a lot of aspects which can be analyzed for promoting the domestic edible oil production and supply. One the of the essential is the cultivation of good quality genotype with high yield potential and ability may improve the yield of the crop (Sher et al., 2021; Zhang et al., 2017; Aktar et al., 2019). Rapeseed genotypes being high oil percentage and yield has the potential to a fill the difference among domestic production and utilization. As the rapeseed crop can survive under scarce or limited water environment and can be effectively cultivated in rainfed region (Raboanatahiry et al., 2021). There are some variations in some morphological and yield parameters such as leaf area index, crop growth rate and total dry matter accumulations between different canola genotypes (Zhang et al., 2017; Erdogdu and Esendal, 2021). *Brassica juncea* gives considerably more yield and yield components than *B. napus* genotypes. Seed oil percentage was more in *Brassica napus* while the contents of erucic acid and glucosinolates were lesser in *B. napus* as compare in *B. juncea* (Namazkar et al., 2016). With proper cultivation of good quality genotypes production of this crop can be increased considerably. Such as, (Dutta, 2014) recorded 18-38% raise in yield of rapeseed by using good quality genotypes following various better management practices. Weather and climate greatly influence the rapeseed productivity as can be evaluated from seasonal yield fluctuations (Fatima et al., 2020). Environmental changes have a massive effect on crop yield and as a result on food availability and the agricultural economy (Nowosad et al., 2016; Fatima et al., 2020).While canola crops are compatible for cultivation in semi-arid locations important change ability takes place in crop yield and oil composition because of climate variations (Arunrat et al., 2017; Manaf et al., 2019). Sabagh et al. (2019) examine the impacts of climate variation on morphological characteristics of rapeseed and showed that high carbon dioxide concentration, temperature and water scarcity disturb the crop production by interrupting the morphological mechanism like abscisic acid production.

Keeping in view the importance of oilseed crops and climate change scenario, the present study was performed to characterize the rapeseed germplasms for seed production and seed oil quality. Study will be helpful for the development of new rapeseed genotypes resilient to climate change. Therefore, major objective of this study was to evaluate the rapeseed genotypes on the bases of morphological traits and yield and oil quality in semi-arid climatic condition.

MATERIALS AND METHODS

Experimental location

A two-year (2018-19 and 2019-20) experiment was conducted at experimental field of College of Agriculture, Bahauddin Zakariya University, Bahadur Sub-Campus, Layyah, Pakistan (30°57'N; 70°56'E; 151m a.s.l).The weather data during the crop growth period was recorded as shown in Table 1. .Soil of the area was sandy loam with N, P and K ratios as 278, 8 and 116 mg kg^{-1}, respectively having pH of 8.1. Experiment was repeated in the same field during both years and sorghum was grown before sowing of *Brassica*.

Table 1. Total rainfall and temperature of the experimental location during 2018-19 and 2019-20

Month	Rainfall (mm)		Average Temperature ˚C			
			Min		Max	
	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20
October	22	33	16.3	18.4	28.2	32.3
November	18.2	13.9	11.6	12.0	21.6	26.0
December	58.8	6.4	5.08	5.1	18.61	16.8
January	9.3	29	7.35	4.7	20.2	17.4
February	57.9	50	11.91	6.5	24.71	21.7
March	66.3	106.2	18.61	12.1	33.74	22.4
April	58.8	16.6	5.08	18.5	18.61	32.7

Source: Adaptive Research Farm, Karor Laleasan, Punjab-Pakistan

Seed material

True to type seeds of rapeseed genotypes were collected from different institutes of PMAS-Arid Agriculture University Rawalpindi, and Barani Agricultural Research Institute (BARI), Chakwal -Pakistan.

Experimental treatments and design

Twenty different rapeseed genotypes *viz.,* Holya-401, Faisal-Canola, AARI-Canola, Hop-09, RBN-04722, Panjab-Sarsoon, RBN-11049, Mulki, PARC-Canola hybrid, Pakola, Canola Raya, Con-II, 19-H, Durr-e-Nifa, RBN-03046, Shiralee, Dunckled, Bulbul, Nifa Gold and Abasin-95 were used in this experiment. Experiment was laid out in a Randomized Complete Block Design (RCBD) having three replications with a net plot size of 5.0 m × 1.8 m.

Crop husbandry

The crop was sown in October 22, 2018 and October 09, 2019 with a single row hand drill by keeping row to row distance of 45 cm and seed rate of 5 kg ha^{-1}. Four irrigations were applied to meet the water requirement of canola crop. The recommended dose was applied (NP; 80-40 kg ha^{-1}) at the time of sowing in the form of urea and diammonium phosphate and nitrogen was applied in two split doses *i.e.,* half was applied at the time of sowing and other half with second irrigation. Weeds were removed manually and no pesticide was applied because no insect pest and disease attack was noticed during crop growth period. Mature crop was harvested in the April 01, 2019 and March 28, 2020.

Data collection

At maturity, plant height of each selected plant from each plot was measured from the base to the tip of the plant using a measuring tape and average was calculated, numbers of primary and secondary branches of each selected plant from each plot were counted and average value was calculated. The numbers of silique per plant of all selected plants from each plot were counted and average was calculated. Thirty siliqua were selected from each plant to count number of seeds per siliqua and average was calculated.

Two central rows were harvested from each plot for biological yield. Harvested samples were sun dried by keeping horizontal for few days. Dehydrated samples were weighed, and biological yield was measured in kg ha^{-1}.Seeds were separated by manual beating and then 1000-seed weight was calculated by using electrical balance then average was calculated. Seed yield (kg ha^{-1}) was measured on weighing balance from harvested samples.

Seed quality parameters

Oil percentage of seed protein percentage, glucosinulate contents and fatty acid profile of seed (erucic acid, linolenic acid and oleic acid) were determined by Near-Infrared Reflectance Spectroscopy (NIRS) (Pérez-Vich et al., 1998).

Statistical analysis

Collected data were analyzed by using the Fisher's analysis of variance (ANOVA) with the help of software CoStat 6.3 (CoHort Software, Monterey, CA, USA). Means of significant sources were separated using the SNK test at 5% probability level.

RESULTS

Morphological traits

Analysis of variance (ANOVA) showed that the rapeseed genotypes significantly ($p<0.05$) differed for number of seed and silique $plant^{-1}$; and non-significant for plant height, primary/secondary branches $plant^{-1}$ and 1000-seed weight (Table 2). Year effect was also significant ($p<0.05$) for primary/secondary branches $plant^{-1}$, silique $plant^{-1}$ and 1000-seed weight; and non-significant for plant height and number of seeds $plant^{-1}$ (Table 2). The interaction of rapeseed genotypes with year was significant for primary branches, number of seed, silique $plant^{-1}$ and 1000-seed weight (given in supplementary file; Table 2). Although, the primary branches and number of seed per plant did not showed the significant interactions between the two years (data not shown). Polled data of two years, maximum siliqua per plant (624) was recorded in genotype 'Dunkled' which was statistically at par with different genotypes 'Durr-e-Nifa, 19-H and Bulbul'. Likewise; maximum the number of seeds per plant (2573) was found in genotype 'Nifa Gold' which was statistically at par with 'Bulbul'. The year 2018-19 performed maximum primary/secondary branches, siliqua per plant and 1000-seed weight (Table 2).

Yield related traits

The ANOVA showed that the rapeseed genotypes significantly ($p<0.05$) differed for seed yield and non-significant for biological yield (Table 3). About 22 and 28% increase in yield variable (2018-19 vs. 2019-20) due to significant years effect (Table 3). The interaction of rapeseed genotypes with year was significant ($p<0.05$) for biological and seed yield (given in supplementary file; Table 3). Polled data of two years, maximum seed yield (2402.5 kg ha^{-1}) was recorded in genotype 'Dunkled' which was statistically at par with 'Nifa Gold', while minimum seed yield was found in genotype 'AARI-Canola' which was statistically at par with various genotypes 'RBN-03046, Mulki, Con-II, Hoyla-401, Panjab-Sarsoon, and HOP-09'. The year 2018-19 performed maximum biological and seed yield (Table 3).

Quality variables

The ANOVA depicted that the rapeseed genotypes significantly ($p<0.05$) differed for oil content, protein content, glucosinolate content (GSL) and erucic acid (Table 4). Year effect was also significant for oil content and GSL; results being non-significant for protein content, oleic acid, linolenic acid and erucic acid (Table 4). The interaction of rapeseed genotypes with year was non-significant for quality variables (Table 4). Amongst rapeseed genotypes, the highest oil/protein contents, (51.8 and 30.8%), and GSL (27.1%) were recorded in 'Nifa-Gold' while minimum oil content and GSL were observed in 'RBN-03046' and protein content in genotypes 'Durr-e-Nifa and19-H'. Likewise; the maximum erucic acid was found in genotype 'Mulki' which was statistically at par with 'Canola-Raya and Punjab-Sarsoon' while minimum erucic acid was recorded in genotype 'HOP-09'. The year 2019-20 performed maximum oil content and GSL (Table 4).

DISCUSSION

The variation in climate put a huge effect on growth of rapeseed crop and affects he physiological and biochemical processes, leading to a variable growth in different climatic conditions (He et al., 2021). Hussain et al. (2019) reported that variation in the environmental conditions can affect physiological and biochemical processes of the plant and ultimately leads to reduced growth and productivity. By using the improve genotypes and the good management practices the yield can be improved. Moreover, genotypes developed considering the climate change scenario, perform better and stable in variable climatic conditions. For instance, (Dutta, 2014) report about 18-38% improvement in the yield of rapeseed and a rapeseed by using improved and climate resilient cultivars. Current study reports that, genotypes differed in their performance for yield and oil quality, although they were grown in the same environment. The differences in the genotypes/species area attributed to the differences in in the genetic constitution of the genotype which pour variable genotype and environment interaction (Sher et al., 2017; Manaf et al., 2019).

Table 2. Plant height, branches per plant, seed per plant and silique per plant of various rapeseed germplasm/genotypes grown under arid climate during 2018-19 and 2019-20

Rapeseed genotypes (G)	Plant height (cm)	Primary branches plant^{-1}	Secondary branches plant^{-1}	Seeds plant^{-1}	silique plant^{-1}	1000-seed weight (g)
Hoyla-401	133.6	6	9	1797 bcd	509 b	2.94
Faisal-Canola	139.8	5	9	215 6bc	492 bc	3.26
AARI-Canola	152.9	6	11	1616 d	433 bcd	3.00
HOP-09	147.1	5	10	1903 bcd	430 bcd	3.24
RBN-04722	146.4	6	9	1795 bcd	372 d	3.34
Panjab-Sarsoon	149.4	5	9	1865 bcd	515 b	2.77
RBN-11049	140.4	5	9	2136 bc	496 bc	3.24
Mulki	134.2	5	10	2137 bc	494 bc	2.96
PARC-Canola Hybrid	130.6	5	8	1959 bcd	494 bc	3.16
Pakola	123.1	5	10	1872 bcd	389 d	3.30
Canola Raya	136.8	5	10	1932 bcd	459 bcd	3.19
Con-II	132.7	6	10	1736 cd	400 d	3.41
19-H	141.3	5	10	2074 bcd	590 a	3.43
Durr-e-Nifa	131.5	6	9	2137 bc	594 a	3.39
RBN-03046	139.0	5	10	1970 bcd	411 cd	2.90
Shiralee	144.0	6	9	1889 bcd	392 d	3.34
Dunkled	147.0	6	10	2127 bc	624 a	3.50
Bulbul	127.0	5	9	2287 ab	592 a	3.08
Nifa Gold	147.4	6	12	2573 a	431 bcd	3.23
Abasin- 95	129.8	5	9	2007 bcd	507 b	2.79
LSD ($p \leq 0.05$)	*ns*	*ns*	*ns*	*287.1*	*55.7*	*ns*
Years (Y)						
2018-19	139.6	5.8 a	11.7 a	2043	536 a	3.28 a
2019-20	137.7	5.1 b	7.7 b	1953	426 b	3.07 b
LSD ($p \leq 0.05$)	*ns*	*0.27*	*0.72*	*ns*	*17.6*	*0.16*
Significance						
Genotypes (G)	*0.115 ns*	*0.432 ns*	*0.541 ns*	*<0.01***	*<0.01***	*0.095 ns*
Years (Y)	*0.528 ns*	*<0.01***	*<0.01***	*0.050 ns*	*<0.01***	*<0.01***
G × Y	*0.327 ns*	*0.017**	*0.052 ns*	*0.014**	*<0.01***	*0.017**
C.V. (%)	11.9	13.8	20.5	12.5	10.1	13.5

Treatment means were significantly differed at $p \leq 0.05$ level

Table 3. Biological and seed yield of various rapeseed germplasm/genotypes grown under arid climate during 2018-19 and 2019-20

Rapeseed Genotypes	Biological yield (kg ha^{-1})	Seed yield (kg ha^{-1})
Hoyla-401	8631.8	1555.4 c
Faisal-Canola	7920.6	1858.4 bc
AARI-Canola	8417.4	1443.6 c
HOP-09	8464.1	1587.7 c
RBN-04722	8758.9	1734.8 bc
Panjab-Sarsoon	8864.6	1559.3 c
RBN-11049	8048.4	1719.2 bc
Mulki	9204.0	1475 c
PARC-Canola Hybrid	8115.9	1914.7 bc
Pakola	8469.8	1636.3 bc
Canola Raya	8969.9	1601.2 bc
Con-II	9442.1	1506.2 c
19-H	8078.2	2075.4 ab
Durr-e-Nifa	9032.7	1735.2 bc
RBN-03046	7857.7	1456.7 c
Shiralee	8599.2	1657.0 bc
Dunkled	7925.7	2402.5 a
Bulbul	8067.3	1667.6 bc
Nifa Gold	9333.6	2368.2 a
Abasin- 95	8463.5	1899.0 bc
LSD ($p \leq 0.05$)	*ns*	*285.9*
Years (Y)		
2018-19	9368.6 a	1954.8 a
2019-20	7697.9 b	1530.5 b
LSD ($p \leq 0.05$)	*443.6*	*90.4*
Significance		
Genotypes (G)	*0.499 ns*	*<0.01***
Years (Y)	*<0.01***	*<0.01***
G × Y	*0.013**	*0.019**
C.V. (%)	14.3	14.3

Treatment means were significantly differed at $p \leq 0.05$ level

Table 4. Oil/protein contents and fatty acid profile of various rapeseed germplasm/genotypes grown under arid climate during 2018-19 and 2019-20

Rapeseed genotypes (G)	Oil content (%)	Protein content (%)	Glucosinolate content (μmol g^{-1})	Oleic acid (%)	Linolenic acid (%)	Erucic acid (%)
Hoyla-401	44.0 c-g	23.5 cde	20.5 bcd	51.6	10.3	26.3 cde
Faisal-Canola	46.0 b-e	23.1 de	19.2 b-e	58.2	8.6	26.3 cde
AARI-Canola	44.0 c-g	24.6 b-e	19.3 b-e	57.0	9.0	28.1 cd
HOP-09	43.8 d-g	25.5 bc	21.9 bc	58.9	9.5	21.1 e
RBN-04722	45.3 b-e	23.9 b-e	20.5 bcd	57.5	9.4	28.4 cd
Panjab-Sarsoon	46.9 bc	24.3 b-e	18.9 b-e	52.7	9.4	35.8 a
RBN-11049	45.3 b-e	23.8 b-e	17.7 b-e	58.3	9.7	26.2 cde
Mulki	44.3 c-f	26.0 b	21.3 bcd	54.8	8.7	36.1 a
PARC-Canola Hybrid	45.7 b-e	23.8 b-e	17.6 b-e	57.9	8.9	29.1 bcd
Pakola	46.3 bcd	24.1 b-e	17.9 b-e	55.3	9.1	31.9 abc
Canola Raya	46.0 b-e	24.9 b-e	19.5 b-e	55.7	8.7	35.9 a
Con-II	46.0 b-e	24.0 b-e	20.5 bcd	53.9	9.0	35.1 ab
19-H	47.3 b	22.5 e	16.8 de	56.9	9.2	32.8 abc
Durr-e-Nifa	47.3 b	22.7 e	17.3 cde	55.6	9.5	30.9 abc
RBN-03046	41.2 g	24.8 b-e	15.1 e	49.1	11.0	24.0 de
Shiralee	46.3 bcd	23.4 cde	16.7 de	55.7	9.4	32.7 abc
Dunkled	44.9 b-f	24.7 b-e	20.8 bcd	57.2	9.1	31.7 abc
Bulbul	43.3 efg	25.3 bcd	18.5 b-e	57.4	8.5	27.7 cde
Nifa Gold	51.8 a	30.8 a	27.1 a	56.0	8.5	31.3 abc
Abasin- 95	42.1 fg	23.1 de	22.2 b	57.0	8.7	32.1 abc
LSD ($p \leq 0.05$)	*2.9*	*2.4*	*4.7*	*ns*	*ns*	*6.6*
Years (Y)						
2018-19	44.2 b	24.2	17.7 b	55.4	9.0	29.6
2019-20	46.5 a	24.7	21.2 a	56.3	9.4	30.7
LSD ($p \leq 0.05$)	*0.92*	*ns*	*1.5*	*ns*	*ns*	*ns*
Significance						
Genotypes (G)	*<0.01***	*<0.01***	*<0.01***	*0.119 ns*	*0.0.080 ns*	*<0.01***
Years (Y)	*<0.01***	*0.160 ns*	*<0.01***	*0.333 ns*	*0.064 ns*	*0.306 ns*
G × Y	*0.960 ns*	*0.987 ns*	*0.841 ns*	*0.983 ns*	*0.998 ns*	*0.981 ns*
C.V. (%)	5.6	8.4	21.2	8.8	12.9	19.2

Treatment means were significantly differed at $p \leq 0.05$ level

In current study, differences were observed among the genotypes for various yield traits. Differences among the genotypes attributed to different genetic makeup of rapeseed genotypes, which lead to difference in performance regarding morphological and yield traits. These results are supported by the findings of other researchers (Iqbal et al., 2008; Abideen et al., 2013; Aktar et al., 2019) who reported differences in rapeseed genotypes for the performance of yield related traits due to variation in the genotype into environment interaction. From the current studies, results revealed that many of the morphological traits of different genotypes of canola showed significant results for number of seeds per silique and number of silique per plants but analysis of variance showed the non-significant results for other traits such as plant height, number of primary and secondary branches but year performance of these traits was found to be significant (Table 1). Non-significant genotypic differences in some genotypes attributed to similarities in the genes of the studied genotypes controlling that particular trait. Amongst canola genotypes Durr-e-Nifa gave maximum number of silique and Nifa Gold gave maximum number of seeds per silique. Results for 1000-seed weight were found to be non-significant. The great variation among different rapeseed genotypes for yield and related traits indicates great potential in the genotypes to be used in a breeding program aiming at the improvement of seed yield of *Brassica*. Currently, results revealed that yield traits of canola like seed yield and biological yield were found to be significant results (Table 2). Amongst canola genotypes Dunkled and Nifa Gold showed maximum value for yield traits i.e. biological yield and seed yield during the both years. Moreover, year effect was also found significant ($p<0.05$) for yield and related traits due to differences in temperature and rainfall of the two years as presented in the table 1. It is reported that temperature, humidity and soil moisture affect the plant growth and development (Sher et al., 2017; Puhl et al., 2019; Sher et al., 2019) resulting in yield differences between the years. This change in temperature directly impacts the length of the phonological stages and influences seed yield (Xiao and Tao, 2014). So, it's essential to recognize the phonological feedback of a crop because of variation in temperature, to establish the improved adaptation techniques, consisting of better agronomic control methods and improve genotypes that may ease the bad effect of climate change (Ismaili et al., 2014; Anwar et al., 2015; Ahmad et al., 2016). Hegelund et al. (2018) reported that differential expression of two transcription factors (rolA-D and aux2) in different rapeseed genotypes alters the fatty acid composition of seed oil. Results revealed from this experiment showed significance for quality variables like oil contents, GSL, protein content and erucic acid were found to be significant amongst canola genotypes; Nifa Gold gave maximum results for oil contents, protein contents and Glucosinolate content (GSL) while Mulki, Punjab-Sarsoon and Canola Raya gave maximum results for erucic acid. Other quality variables like oleic acid and linolenic acid were found to be non-significant among different canola genotypes (Table 3). Differences at gene level for seed oil composition in rapeseed have also been reported by other researchers (Sing et al., 2019; Spasibionek et al., 2020). Year effect was also found significant for seed oil composition, which attributed to the differences in temperature of humidity and rainfall of the two years (Safdari-Monfared et al., 2020; Erdogdu and Esendal, 2021). The total availability of water and the temperature during the flowering stage had an impact on the oil, protein, and the seed yield total unsaturated fatty acid (Singer et al., 2016). This variation among the rapeseed genotypes for oil yield and fatty acid composition can be used in rapeseed breeding program to develop rapeseed genotypes with premium quality oil.

CONCLUSIONS

From the findings of results, it is concluded that here is an existence of greater genetic diversity in the tested genotypes under the arid climate which might be exploited in future breeding programs for developing new rapeseed genotypes to get maximum production and seed oil quality in arid climate. A wide range of variation was observed for morphological traits, yield variables and oil quality among various rapeseed genotypes. Based on results, the genotypes 'Dunkled and Nifa-gold' appears high yielding genotype having good oil quality in overall scenario of crop features. Genotype 'Dunkled' also performed better for biological yield as well as seed yield. Huge variation among various rapeseed genotypes shows potential of the germplasm to be used in breeding program to develop high yielding and climate resilient rapeseed genotypes. Therefore, the recommended genotypes for local climate of Layyah region are 'Nifa Gold' and 'Dunkled' for their better growth, yield and oil quality due to their better performance.

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