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ASSESSMENT OF BRUSSELS SPROUTS GENOTYPES BASED ON GERMINATION AND HEADING FORMATION

Nandni Lakhwani[*1], Saleem Raza[*2] Nisheeta Lohana[*3], Bhoomika lohana[*4] Manahail Kaimkhani[*5,] Siniha Kundnani*[6] and Nimra awan*[7]

1. Department of Plant Breeding & Genetics, Sindh Agriculture University Tandojam-Pakistan
2. Department of Pre –Medical science AJ Science College Mirpurkhas Pakistan
3. Department of Pre-engineering AJ Science College Mirpurkhas Pakistan

Abstract: evolution of genotypes is major criteria for improvement, therefore the present research was conducted in the month of November 2022 at AJ Science college Mirpurkhas the aim of this research was to evaluate the performance of Brussels sprouts under normal and organic compost soil by using two hybrid genotypes namely Dagan and Redarling based on germination percentage and heading formation. Research was conducted early in pot experiment with six pots containing 15 number of seeds. Later it was transplanted into main field. Result regarding pot experiment under organic compost declared that POT-IV was considered with maximum germination percentage (66.66%) and while the minimum germination percentage was noticed in POT-II and POT-VI (46.6%). The result for Variety-I in normal soil condition depicted that maximum germination percentage was reported in POT-V (73.3%), whereas the POT-III was recorded with minimum germination percentage (46.6%). It proposes that the soil contain favorable conditions for Brussels sprouts growth which could be beneficial for upcoming selection for further improvement. In case of variety-II POT-V was recorded with maximum germination percentage under organic compost soil (53.3%), while greater value for germination under normal soil was reported in POT-V (73.33%). Considering head formation for variety-I under organic compost soil POT-II plants were taken maximum days, while the POT-III was recorded with minimum days. In case of variety- II POT-IV was recorded with maximum number of days whereas the POT-III was noted with minimum number of days.

Regarding beginning of head formation for variety- I and II under normal soil the POT-VI was taken with maximum number of days while POT-III for variety-I and POT-V for variety-II were noticed with minimum number of days. It indicates that Brussels sprouts possess good resources and favorable environment. If this crop is included for further evolution and horticultural breeding program it may be best resulted for obtain maximum yield.

Key words; Germination percentage, Brussels sprouts, heading formation and soil conditions

I-Introduction: A member of the Brassicaceae family, Brussels sprouts (Brassica oleracea L. var. gemmifera L.) have been the subject of extensive research on topics such as their ability to prevent cancer, when to sow and plant, how dense the plants are, when to stop fertilizing, and how temperature affects plant growth. Kurtar (2006). To address global concerns that influence food security, sustainability, and climate change adaptation, plant breeders employ variety in genetic resources to create new and improved crop cultivars. While genetic variation refers to the genetic differences between individuals for a given feature, these genetic differences often lie in one or more DNA sequences, genetic diversity can be defined as the range of genetic characteristics in a crop or species. By evaluating variations in a population's DNA sequence, genetic diversity can be evaluated. (Choudhury, Khan, & Dayanandan, **2014**; Haun et al., **2011**; van de Wouw, van Hintum, Kik, van Treuren, & Visser, **2010**). One of the biggest and most significant angiosperm families is the Brassicaceae, also known as the crucifer or mustard family. There are 370 genera, more than 4000 species, and 10 vaguely defined tribes in it. The family Brassicaceae, which includes the well-known model plant Arabidopsis thaliana (L.) and several vegetable, fodder, and oil-producing Brassica oleracea (cabbage, cauliflower, broccoli, sprouts, etc.), B. rapa (chinese cabbage, pak choi, etc.), and B. napus (oilseed rape, canola, etc.) crops, has great scientific, agronomic, (Sun, 2018; Zou, 2019).

It has medicinal value and is a rich source of minerals like phosphorus, potassium, calcium, sodium, and iron. It is grown in India's agricultural climate zones. India is a developing nation that has attained food self-sufficiency and a high level of sustainability. Nonetheless, because a sizable portion of the population is undernourished, it is urgently necessary to provide nutritional security to the population through a balanced diet. (Gariya et al, 2019). It is a significant vegetable in the nations of Europe. Although being a well-liked vegetable in England and its continents, the United States of America only occasionally

cultivates this vegetable. It was introduced to England from Belgium (1810). New York's Long Islands are famous for their production of Brussels sprouts in several areas. (Tewari et al, 2020).

Sprouts generally have a longer shelf life if taken at the right stage, and there are also many hybrid kinds that are excellent for freezing. Therefore, there is a significant chance that it will be exported as a fresh vegetable from its cultivation locations to hotter regions both inside and beyond the nation. (Tewari et al, 2020). Therefore the aim of current research to estimate performance of Brussels sprouts based on their germination and other phenotypic traits.

II-Material and Method

The research was conducted based on pot experiment later it was tested in field the two hybrid cultivars of Brussels sprouts including Dagan and Redarling were grown in six pots each pot comprised fifteen seeds the varieties were sown in the month of November 2023. The material was checked at green house of AJ Science Collage Mirpurkhas, Sindh by using two applications of soil. Soil with rich source of organic matter and soil with the applications of chemical fertilizers based on germination. The soil organic matter content ranged from 2.0 to 2.5% and its humus horizon reached a depth of 55–65 cm. The soil reaction was slightly alkaline. The total content of nitro- gen ranged from 2.75 to 7.02 g, phosphorus from 2.25 to 3.25, and potassium from 25.03 to 45.01 g × dm-3 of soil. Seeds of Brussels sprouts 'Franklin F1' were obtained from the Dutch seed company Bejo Zaden. According to the producer the earliest yield of heads is possible to obtain after 128 days. In field these varieties were grown in four random rows with spacing and following parameters were recorded Number of days from sowing including Beginning of head formation and Technical maturity, number of heads per plant.

STASTICAL ANALYSIS

The study was based on germination the calculated data was assessed by using the germination percentage formula recommended by (Khalaki et al, 2019).

$$\text{Germination percentage (\%)} = \frac{\text{Germinated seeds}}{\text{Total seeds}} \times 100$$

IV-Result and Discussion

Brussels sprout is an important vegetable which is grown successfully in the world the current research was carried out in pot experiments at AJ science College Mirpurkhas the goal of this experiment to check the Brussels sprouts performance in current situations the two hybrid varieties of Brussels sprouts were grown in pot experiments at green house later it was transferred to field. The two genotypes of this

crop were sown in 6 pots with fifteen number of seeds in two different conditions. The result regarding germination percentage for variety-I in organic compost soil is represented in Table.1 POT-IV was considered with maximum germination percentage (66.66%), followed by POT-III (60%) and while the minimum germination percentage was noticed in POT-II and POT-VI (46.6%) the overall germination for variety-I under organic compost soil was noticed with greater contribution (54.4%). The result for Variety-I in normal soil condition is represented in Table.2 maximum germination percentage was reported in POT-V (73.3%), followed by POT-II (66.6%), whereas the POT-III was recorded with minimum germination percentage (46.6%), and the total germination percentage for variety-I under normal soil was recorded (60%). It proposes that the soil contain favorable conditions for Brussels sprouts growth which could be beneficial for upcoming selection for further improvement. The outcomes with concern to Variety-II in organic compost soil which is illustrated in Table.3. The maximum germination percentage was noted in POT-V (53.3%), followed by POT-IV (53.3%), while the minimum germination percentage was noticed in POT-VI (26.6%). The Total germination percentage was reported (41.11%) for variety-II in organic compost soil. In case of variety-II under normal soil condition result is presented in Table.4 POT-I and POT-V were considered with greater values for germination percentage (73.3%), while the minimum was noted in POT-VI (53.3%). Whereas the overall germination percentage for Variety-II under normal soil was noted (53.33%). (Ensslin et al. 2017) tested germination of this crop. It is suggested that the variety-II also performed better in normal soil which could be best resulted if it should be included in horticultural breeding program in Mirpurkhas. Later these pots data were transferred to the major field these plants were transplanted in both the soil and randomly grown in different rows when the seedlings was 10-16 cm tall with 2 to 5 leaves. In field the data for beginning of head formation and maturity was taken. The result for beginning of head formation for variety-I and II under normal and organic compost soil is mentioned in Table.5. The data was collected in 5 plants from each pot and their average was calculated. Under normal soil the POT-IV was recorded with maximum number of days while the POT-III was reported with minimum number of days (99), in case of variety –II which indicated that the maximum number of days for head formation was noted in POT-VI, whereas the POT-III was noticed with minimum number of days. The result for organic compost soil with concern to variety-I expressed that POT-II (126) was considered with maximum number of days, while the minimum value was noted in POT-V (119). The variety-II POT-IV was recorded with maximum number of days while the POT-III was noticed with minimum number of days. Almost similar findings were reported by (Turbin et al. 2014) where they evaluated Brussels sprouts lines under different spacing conditions. The result indicates that Brussels sprouts possess good resources and favorable environment. If this crop is included for further evolution and horticultural breeding program it may be best resulted for obtain maximum yield.

Table. 1 Results for germination percentage in variety- I under normal soil condition

Variety-I (Dagan)			
Pot with organic compost	**NO of germinated seed**	**Total number of seeds**	**Germination (%)**
POT-I	8	15	53.3%
POT-II	7	15	46.6%
POT-III	9	15	60%
POT-IV	10	15	66.6%
POT-V	8	15	53.3%
POT-VI	7	15	46.6%
Total	49	90	54.4%

Table. 2 Results for germination percentage in variety- I under normal soil condition

Variety-I (Dagan)			
Pot with Garden top soil	NO of germinated seed	Total number of seeds	Germination (%)
POT-I	9	15	60%
POT-II	10	15	66.6%
POT-III	7	15	46.6%

POT-IV	8	15	53.3%
POT-V	11	15	73.3%
POT-VI	9	15	60%
Total	54	90	60%

Table. 3 Results for germination percentage in variety- I under organic compost soil

Variety-II (Redarling)			
Pot with organic compost	**NO of germinated seed**	**Total number of seeds**	**Germination (%)**
POT-I	7	15	46.6%
POT-II	6	15	40%
POT-III	5	15	33.3%
POT-IV	7	15	46.6%
POT-V	8	15	53.3%
POT-VI	4	15	26.6%
Total	37	90	41.11%

Table. 4 Results for germination percentage in variety- II under normal soil condition

Variety-II (Redarling)			
Pot with Garden top soil	NO of germinated seed	Total number of seeds	Germination (%)
POT-I	11	15	73.33%
POT-II	9	15	60%
POT-III	10	15	66.6%
POT-IV	9	15	60%

POT-V	11	15	73.33%
POT-VI	8	15	53.3%
Total	48	90	53.33%

Table. 5 Results for heading formation for variety- I and II under normal and organic compost soil.

Beginning of head formation Pot with Garden top soil			**Beginning of head formation Organic compost soil**	
POTS	Variety-I **(Dagan)**	Variety-II (Redarling)	Variety-I **(Dagan)**	Variety-II (Redarling)
POT-I	101	123	125	122
POT-II	102	125	126	119
POT-III	99	119	121	118
POT-IV	104	120	122	123
POT-V	102	117	119	122
POT-VI	106	124	123	120

V-Conclusion

The whole research concluded that Brussels sprouts is an important source of vegetable which considered major significance regarding income source. The our research was recorded with better performance it must be included for further horticultural breeding program in Mirpurkhas district and must be focused on this crop it possess better environment for cultivation.

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