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Identification and selection of local carrot seeds (Daucus carota L) for seed sources

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Abstract

Carrot (Daucus carota) is one of the most important root vegetables in Indonesia contains high levels of sugars, is rich in β-carotene (pre-vitamin A), ethylene, and high levels of proteins. The carrot was reported as a medicinal plant in the gardens and an essential part of the food coloring industry. The seeds of carrot contain estrogen, and in some cultures are used as an effective method of contraception. Carrot has been promoted as a future ingredient in biofuels, the carrot seed oil has proved to be an excellent lubricant in industrial applications, appears in a multitude of skin and hair care products, and produced luteolin. Carrot grows vegetatively in the first season and produced seed in the second. The yield and quality of carrot grown are determined by the seed production technique which can flourish carrot seed production as well as compensate high cost of carrot seed. The use of local varieties of carrot as a seed source increases productivity through high adaptability. The research aims to obtain the best possible tuber characteristic as a qualified seed source. The research was conducted by the exploration method of carrot tuber in the Lembang Jaya area and study the morphological characters. The exploration result obtained 8 carrot tuber locations. The carrot tuber with a chantenay type had the best growth and yields of the seeds to develop.

Keywords: antioxidant, essential oil, exploration, nutrition, orange, precursor, seed-to-seed, umbel

Introduction

Carrot (*Daucus carota*), one of the most important vegetable plants with a variety of benefits. Carrots are extraordinarily nutritive and rich in bioactive compounds like carotenoids and dietary fibers and are also a good source of carbohydrates, vitamins, and minerals (Frias et al., 2010; Velescu et al., 2013). It comprises xanthophylls, lycopene, and anthocyanin, which β impart such as yellow, orange, red, purple, and black to carrots (Ahmad, *et al*., 2012). Multiple benefits have led to carrot demand increase population growth, increased purchasing and living standards of society, and increased carrot industry. Efforts to increase carrot production can be made through improvements in the field of choice. Carrot is highly outcrossing and insect-pollinated. The availability of qualified seeds is a prerequisite for maximum yield. To obtain quality seeds, select specific criteria, such as size and health, and enhanced techniques, including trimming and umber position (Amjad, et al., 2005). Quality carrot seeds are obtained from a physiologically ripe carrot flower and are derived from a character-quality tuber. Limited quality seed availability and high seed prices cause carrot productivity to decrease. Thus, local varieties of carrots need to be developed as carrot seeds that can boost production. The best selection for the public will be the first step in improving the new, improved variety. Improvements in carrot varieties can be started by determining quality criteria and developing methods that can quickly and accurately assess those criteria. They may include the criteria for bulbous color, texture, taste, and appearance (Karklelienė, *et al*., 2012).

One of the carrot centers in west Sumatera is Solok Regency, especially the Lembang Jaya area. Field observations have been found that farmers use abnormal carrot seeds to minimize the cost of seed purchases and poor use of seeds that cause carrot production to decrease. Add to that the carrot farming technique for the seed that has no maximum yield. It also causes a lot of low-quality and unsuitable carrots to sell at the market, resulting in lowered production and selling prices and reduced farmer income. The study aims to find information on the location of carrot farming in the Lembang Jaya area, farmers information source in determining the tuber good type characteristics as the source of carrot seed, and to get the best produce The increasing production of carrot seed increase the quality and quantity of carrot production.

Materials and Methods

The field research was conducted in Lembang Jaya District, Solok Regency, West Sumatera province. Carrot laboratory test was conducted at the soil science laboratory, the seed science, and technology laboratory, and agronomy laboratory, Department of Agriculture, Faculty of Agriculture, Andalas University, Padang. The research was conducted from November 2020 to June 2021.

This research was carried out by the exploration method with purposive sampling technique of carrot tuber in Lembang Jaya District, especially in Nagari Salayo Tanang Bukit Sileh, Nagari Koto Laweh dan Nagari Batu Bajanjang area with location determination and survey, observation of morphological characters. The subjects used in this study are local varieties of carrot tubers. The tools used in research include hoes, shovels, scissors, knives, gauges, analytic scales, vernier calipers, system positioning global, camera, stakes, strings, labels, markers, plastic, and paper bags, sacks, cameras, stationery, and software. There are four stages. To begin with, the location exploratory of a carrot farm has ready for harvest. In addition, the identification and selection of carrot tubers to be used as leverage. The harvested carrot tuber with weights, diameter, and uniform length. Furthermore, the carrot tubers are characterized morphologically. Finally, seed production used experimental methods in a completely randomized design with 8 locations of carrot tuber sources (BB1, KL1, SB1, SB2, SB3, SB4, SB5, dan SB6). Data were analyzed using the T-test, followed by Tukey's honestly significant difference test at 5% level. The carrot tubers are planted by position 40°. It is done with stakes installation, sprinklers, wedges, and condensation, trimming, fertilizing, plant-resistant organisms, and harvesting with the ripening of the stem with brown features, the flower petals start to yellow, the seed is already brown and dense. As for the variable made during the study of exploration data location, coordinate and altitude, morphological characteristic, plant height, leave number, branch number, flowering age, and seeds weight.

Results and Discussion

Exploration of Carrot

The result of the exploration was found in 8 areas from 3 Nagari in Lembang Jaya District, Solok Regency, West Sumatera Province. The location found are in Table 1. The sample farm was owned by farmers who had been through the carrots for quite some time The altitude at which the carrot samples were collected was 1300 m (3,600 m) from 1600 m (3,600 m). This area is a balmy landscape of hills and is cultured according to horticultural plants. Jumin (2005) says that temperature will affect plant physiological processes regarding plant growth, when high temperatures and low humidity cause absorption of nutrients because of increased transpiration and photosynthesis is impetuated.

Table 1. Location of carrot

No.	Location	Code	Coordinate	Altitude
1	Limau Puruk, Batu Bajanjang	BB1	-0°56'24", 100°42'21", 193°	1300,0 m
2	Taratak Baru, Koto Laweh	KL1	-0°59'31", 100°43'31", 209°	1595,6 m
3	Kopi, Salayo Tanang Bukit Sileh	SB1	-0°57'29", 100°43'1", 168°	1348,3 m
4	Data, Salayo Tanang Bukit Sileh	SB2	-0°58'9", 100°43'1", 48°	1383,5 m
5	Rumah Panjang, Salayo Tanang Bukit Sileh	SB3	-0°57'59", 100°43'20", 167°	1458,2 m
6	Simpang, Salayo Tanang Bukit Sileh	SB4	-0°58'31", 100°43'31", 219°	1585,8 m
7	Lakuek, Salayo Tanang Bukit Sileh	SB5	-0°57'53", 100°42'56", 296°	1384,7 m
8	Lembang, Salayo Tanang Bukit Sileh	SB6	-0°58'7", 100°42'54", 29°	1379,0 m

Qualitative Character

Carrot characteristics are obtained with two types of tuber, chantenay, and the imperator. More umber with a chantenay type is found at nagari Selayo Tanang Bukik Sileh with a tuber length of 10.7 to 20.4 cm (20.4 in.) (Stolarczyk and Janick., 2011). Tubers are dominated by orange to dark orange. Table 2 contains characteristics of carrot tubers obtained from 8 locations.

Carrot morphology is influenced by several factors: climate, topography, seed sources, soil and nutrients, and maintenance. The type of carrot found in the Lembang Jaya is the chantenay and imperator of almost the same size and color. Surveys have been obtained that abnormal seed carriers and self-contained seeding agents without knowing the characteristics of a good carrot tuber as a stock. The farmers' farming techniques of 3 areas are different, and thus the growth and production of carrots are different. Good and constant fertility of the soil is needed to facilitate the production and translocation of carbohydrates from the leaves to the roots. Key factors in the barrier of plant growth, nutrition are essential in development and results (nitrogen, phosphorus, and potassium) and water (Glass, 2003; Parry et al..2005).

Table 2. Carrot morphological characters and soil analysis

Location	Images	Type	Length (cm)	Color	Shape	Skin
BB1		Chantenay	14,2 - 21,4	orange	Blunt	Smooth
KL1		Imperator	14,3 - 20,8	orange	Pointed	Smooth

SB1		Chantenay	10,7 - 20,3	orange	Blunt	Coarse
SB2		Chantenay	11,3 - 20,9	orange	Blunt	Smooth
SB3		Imperator, Chantenay	12,3 - 19,5	orange	Blunt, pointed	Coarse
SB4		Chantenay	13,7 - 20,1	Dark orange	Blunt	Smooth
SB5		Imperator	12,7 - 16,1	orange	Blunt. Pointed	Coarse
SB6		Chantenay	11,5 - 18,9	orange	Blunt	Coarse

The soil analysis results that carrot size, carrot shape and color does not different in the same nutritional concentrations. The soil with solid texture leads to the development of imperfect tuber with small sizes and

rough tubers. Whereas the soil with a crumb texture gives space to the developing carrots with a larger space, allowing the tuber root and the smooth surface of the tuber. This coincides with the study Sumpena and Meliani (2005) that carrot tuber have difficulty

growing on soil that is physically undesirable in soil. The soil that is not ground prepared or no-tillage is not in favor of the growth of root and root carrots. Solid, unyielding soil forms a bulging barrier to lengthen and expand. (Nunez et al., (2008) note that carrot plants need soft soil and crumbs for root growth and development.

Quantitative Character

Data analysis with 5% F test indicates that the location of the tuber of carrot seed sources has a real effect on the plant's height variables, Based on table 3, the data of week to flower and seed yield/plant show the result of further analysis (Tukey). Therefore the location affects those variables.

Table 3. Growth and yield of carrot plants

Location	Plant height (a)	Number of leaves (b)	Branch number (c)	Week to flower (d)	Seed yield per plant (e)
BB1	41.38 c	26.60	8.20	9.28 b	7.35 bc
KL1	19.56 a	18.20	5.67	7.50 a	4.93 ab
SB1	39.60 bc	33.60	6.67	7.70 a	6.65 bc
SB2	50.50 d	27.25	6.40	7.50 a	3.41 a
SB3	31.90 bc	29.00	7.00	9.00 b	6.18 bc
SB4	42.10 c	27.40	7.60	10.20 c	9.02 c
SB5	33.40 bc	29.50	7.00	7.90 a	5.05 ab
SB6	24.10 ab	27.60	7.30	12.40 d	7.60 bc

The numbers in the column are significantly different according to the F test at a 5% significance level

Significant variation was found in plant height with the highest plant height SB2 (50,50 cm) was statically identical to SB4 (42,10 cm) and BB1 (41,38 cm). The lowest plant height (19,56 cm) was recorded in SB6. Plant height is between 20 cm (12 in.) -51 cm (12 in.). The high difference between carrot plants is due to genetics, environment, and farming techniques. Genetically, each plant has its unique distinctiveness, leading to differences in morphology and growth. In addition, the environment and development techniques such as climate, topography, seed, agriculture, and post-harvest techniques will affect the growth and produced carrot seeds. Awas, et al. (2010), the variety has a different root, different growth habits, and optimum conditions. Each variety has a varying genetic advantage so that each variety has a different production, depending on the variety of the plant itself (Soegito and Arifin, 2004). The number of leaves on all treatments is almost no different, ranging from 18 sheets – 34 sheets. The number of branches on the research is also the same along 6 branches - 8 branches. Each branch ending in a compound umbel.

The data presented in table 3 (d) shows that KL1 carrot tuber, SB1, SB2, SB5 are early flowering. than BB1 carrot tuber, SB3 which is not at all different from the SB4 carrot root, and the SB6 carrot tuber as delay flowering. Flowers are arranged in spirals and development is centripetal. Genetic and environmental screening of carrots. Different varieties affected bulbous sizes. Large-size carrot bulbs have more food reserves to support initial growth and seed production through optimal raising techniques. Size of the bulbous with limited food reserves disrupts the initial growth process that results in annoyance of vegetation. Another factor affecting growth and seed production is temperature. Temperature is affecting enzyme activity that catalyzes the anomaly. Flowers are produced after the plant has been profitable below 50 levels for 6-8 weeks. There was a significant variation in seed yield per plant in Table 3 (e). The maximum seed yield per plant (9.02 g) was obtained from SB4 which was statically different from BB1, SB1, SB3, and SB6. The minimum seed yield per plant (3.41 g) was obtained from SB2. But, it has a final bloom time. Many factors affecting the growth and production of carrot seeds, the use of quality seeds is a major factor. There are different methods in seed production, which are seed to seed and root to root. Seed production is affected by plant spacing, planting pattern, materials, nutrition, the health of the mother plant, rootage, root size, and shape (Amjad, et al., 2005).

Conclusion

Local varieties of carrots from exploration obtained 8 locations with two types of tubers. The most recent location of carrot farm in Nagari Salayo Tanang Bukit Sileh. The chantey type and SB4 have the best growth and seed yield. It is hoped that advanced research will provide the best quality and quantity that can be developed.

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