Plant Archives Vol. 21, Supplement 1, 2021 pp. 2566-2571 e-ISSN:2581-6063 (online), ISSN:0972-5210

Plant Archives

Journal homepage: http://www.plantarchives.org
doi link : https://doi.org/10.51470/PLANTARCHIVES.2021.v21.S1.419

GERMINATION OF SUNFLOWER SEED IN DIFFERENT MEDIA

Arshdeep Singh[1], Shimpy Sarkar[2]*, Jaspreet Kaur[2], Deepika Gundlee[2], Altaf Hussain[2] and Yogesh Kalmodiya[2]
[1]Department of Agronomy, School of Agriculture, Lovely Professional University, Phagwara-144411, Punjab, India
[2]Department of Entomology, School of Agriculture, Lovely Professional University, Phagwara-144411, Punjab, India
*Corresponding author's mail: shimpy.23645@lpu.co.in

ABSTRACT

A study was carried out at Lovely Professional University, Phagwara (Punjab) with the aim to evaluate the impact/s of substrates on the germination and seedling emergence of sunflower, an ornamental flower crop. The ornamental sunflower crop is gaining popularity in recent times because the gestation period of investment on this crop is very short, moreover it has expressive representation in the flower market and the research on the idea to substrate for seedling production to increase the information for the crop. The experiment has been conducted in a polyhouse, where they were put to germinate seed of sunflower type *Sadabahar* sunflower F-1 Hybrid in the polysterene trays on substrates. The experiment was conducted with seven different media viz. sawdust, sand, soil, sawdust + sand (1:1), sawdust + soil (1:1), sand + soil (1:1), sawdust + sand + soil (1:1:1). Germinated seeds were counted daily over a period of 15 days. To estimate the seedling emergence from two weeks after sowing up to four-week, data on seedling height and number of leaves were recorded. The result showed that germination started in 8 days after sowing for all the substrates. The highest germination rate was recorded on sawdust substrates (83%), while the lowest rate (55%) on soil seedling on the sawdust substrates had maximum 5 leaves.

Keywords: Growing media, sunflower, germination

Introduction

Sunflower (*Helianthus annuus* L.) belongs to the family Asteraceae. Helianthus genus contains 65 different species (Andrew *et al*., 2013). The name Helianthus, being derived from *helios* (the sun) and *anthos* (a flower), has the same meaning as the English name Sunflower, which has been given to these flowers from a supposition that they follow the sun by day, always turning towards its direct rays. The sunflower that most people refer to is *H. annuus*, an annual sunflower. In general, it is an annual plant which possesses a large inflorescence (Flowering head), and its name is derived from the flower's shape and image, which is often used to depict the sun. The plant has a rough, hairy stem, broad, coarsely toothed, rough leaves and circular heads of flowers (Khaleghizadeh, 2011). The heads consist of many individual flowers which mature into seeds on a receptacle base (Seghatoleslami *et al*., 2012).

Sunflower is the world's fourth largest oil-seed crop and its seeds are used as food and its dried stalk as fuel. It is already been used as ornamental plant and was used in ancient ceremonies (Harter *et al.,* 2004; Muller *et al*., 2011). Additionally, medical uses for pulmonary afflictions have been reported. In addition, parts of this plant are used in making dyes for the textile industry, body painting, and other decorations. Sunflower oil is used in salad dressings, for cooking and in the manufacturing of margarine and shortening (Kunduraci *et al*., 2010).

A coffee type could be made with the roasted seeds. In some countries the seed cake that is left after the oil extraction is used as livestock feed. In the Soviet Union, the hulls are used for manufacturing ethyl alcohol, in lining for plywood and growing yeast. The dried stems have also been used for fuel. The stems contain phosphorous and potassium which can be composted and returned to soil as fertilizer. Sunflower meal is a potential source of protein for human consumption due to its high nutritional value.

Uses:

(A) Edible oil:

Commercially available sunflower varieties contain 39 to 49% oil in the seed. In 1985- 86 sunflower seed was the third largest source of vegetable oil worldwide, following soybean and palm. Sunflower accounts for about 14% of the world production of seed oils (6.9 million in 1985-86) and about 7% of oil cake and meal produced from oilseeds.

Sunflower oil is generally considered as a premium oil because of its light color, high level of unsaturated fatty acids and lack of linolenic acid, bland flavor, and high smoke points.

The primary uses are as a salad and cooking oil or in margarine. It has expanded the application of sunflower oils for frying purpose, tends to enhance shelf life of snacks and could be used as an ingredient of infant formulas requiring stability.

(B) Meal:

Sunflower meal is higher in fiber, has a lower energy value and is lower in lysine but higher in methionine than soybean meal. Protein percentage of sunflower meal range from 28% for non-decupled seeds to 42% for completely

decupled seeds. The color of the meal ranges from grey to black, depending upon extraction processes and degree of dehulling.

(C) Industrial applications:

Sunflower oil is used commonly in the manufacture of soap and detergents**.** The use of sunflower oil as a pesticide carrier, and in the production of agrochemicals, surfactants, adhesives, plastics, fabric softeners, lubricants and coating has been explored. The utility of this application is usually contingent upon petrochemical feedstock prices.

Sunflower oil contains 93% of energy of US number 2 diesel fuel and considerable work has been done to explore the potential of sunflower as an alternate fuel sources in diesel engines.

(D) Non-oilseed:

The use of sunflower seed for birdfeed or in human diets as a snack has grown consistently over the past 15 years. Varieties used for non-oilseed purposes are characterized by a larger seed size and requires slightly different management practices. During processing, seed is divided into 1. Larger seed for shell roasting 2. Medium for dehulling, 3. Small for birdseed. Standards for different uses vary as per requirement.

(E) Forage:

Sunflower can also be used as a silage crop. It can be used as a double crop after early harvested small grains or vegetables, an emergency crop, or in area with a season too short to produce mature corn for silage. Nutritional quality of sunflower silage is often higher than corn.

Materials and Methods

The present investigation was carried out under field condition in the "Agricultural Research Field, School of Agriculture, Lovely Professional University, Phagwara, and Punjab 144411.

Geographical location: The experiment was conducted in the field conditions of Lovely Professional University, Phagwara.

Climatic conditions:

- Average annual temperature-32℃
- Average rainfall- 686mm
- Precipitation is the lowest in November with an average of 6mm and highest falls in July i.e. 197mm
- June is the hottest month of the year, temperature-33.6℃
- January has the lowest average temperature i.e. 12.7℃
- During this year, the average temperature varies by 20.9℃

Experimental site: This project was conducted in the polyhouse of Lovely Professional University of Agriculture, Phagwara, Punjab (31, 15'47″N, 75, 41'20″ E).

Climate type is generally humid tropic with rainforest vegetation type. It is characterized by uniform high temperatures which changes slightly during the year. The average annual temperature and rainfall are 32 ℃ and 686 mm respectively.

Ornament sunflower seed type Sadabahar sunflower hybrid F1 was put to germinate in polystyrene tray on different substrates. The experimental draw was completely randomized with 7 treatments with 7 rows and 70 seeds. Poultry manure was added to all treatment. The seeds were sown per pot at 2cm depth as recommended by guidelines for sunflower growing. Germination test gives the percentage of no. of seeds that germinate in a short period of time. Sowing date: 22 Feb. 2020

Variety: Sadabahar sunflower F1 hybrid

Fig.1. Variety: Sunflower F1 hybrid seeds

Fig. 2. Treatments of 7 different substrate

Sl.no	Treatment	Material used
1	T1	Sawdust
2	T2	Sand
3	T3	Soil
4	T4	Sawdust + sand (1: 1)
5	T5	Sawdust + soil (1: 1)
6	T6	Sand + soil (1:1)
7	T7	Sawdust +sand +soil (1: 1: 1)

The evaluations were carried out during the period of 20 days, being considered germination the seed that presented seedlings with the height of shoot a minimum of two millimeter. We have evaluated, germination percentage, length of shoot and no of leaves.

Fig. 3 : A: Collecting material, B: Display of 7 treatments, C and D: Sowing seeds

Results and Discussion

Parameters

1. Germination percentage of seeds
2. Effect of substrate on seed germination
3. Effect of sawdust on seed germination

Table 1 : Seed germination percentage

S. No	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10	Avg. (%)
T1	90	100	80	80	80	80	80	80	80	80	83
T2	40	50	60	60	70	70	70	70	70	70	63
T3	50	70	70	80	80	80	70	70	70	70	72
T4	10	50	60	60	70	60	60	60	60	60	55
T5	40	60	60	60	70	60	60	60	60	60	60
T6	30	70	70	80	80	80	70	70	70	70	70
T7	40	80	70	70	70	70	70	70	70	70	68

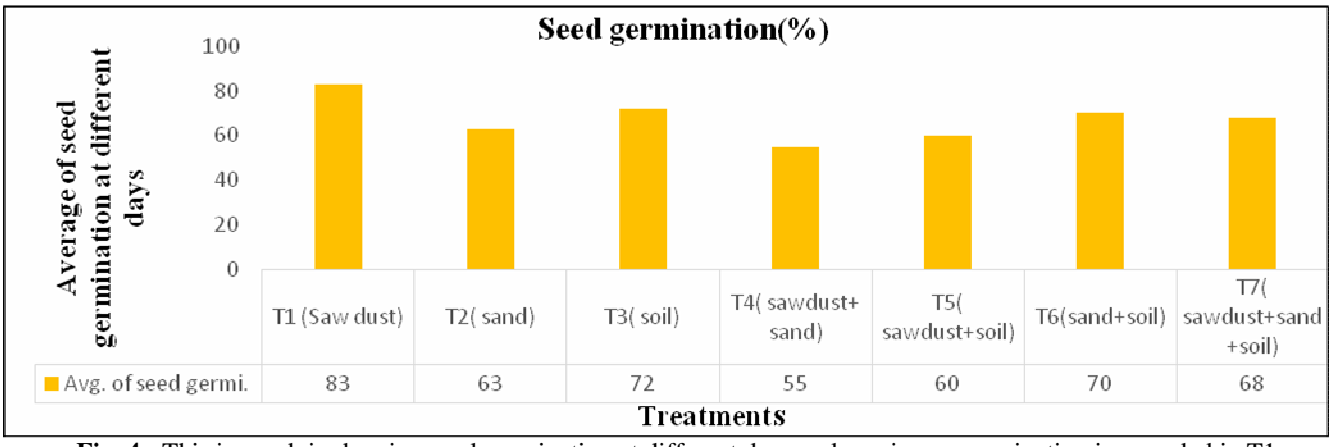

Fig. 4 : This is graph is showing seed germination at different days and maximum germination is recorded in T1.

Table 2 : No. of leaves:

Treatments	Day 5	Day 10	Day 15	Day 20
T1	0	2	4	6
T2	0	2	4	4
T3	0	2	4	4
T4	0	0	2	4
T5	0	2	4	4
T6	0	0	2	4
T7	0	2	3	4

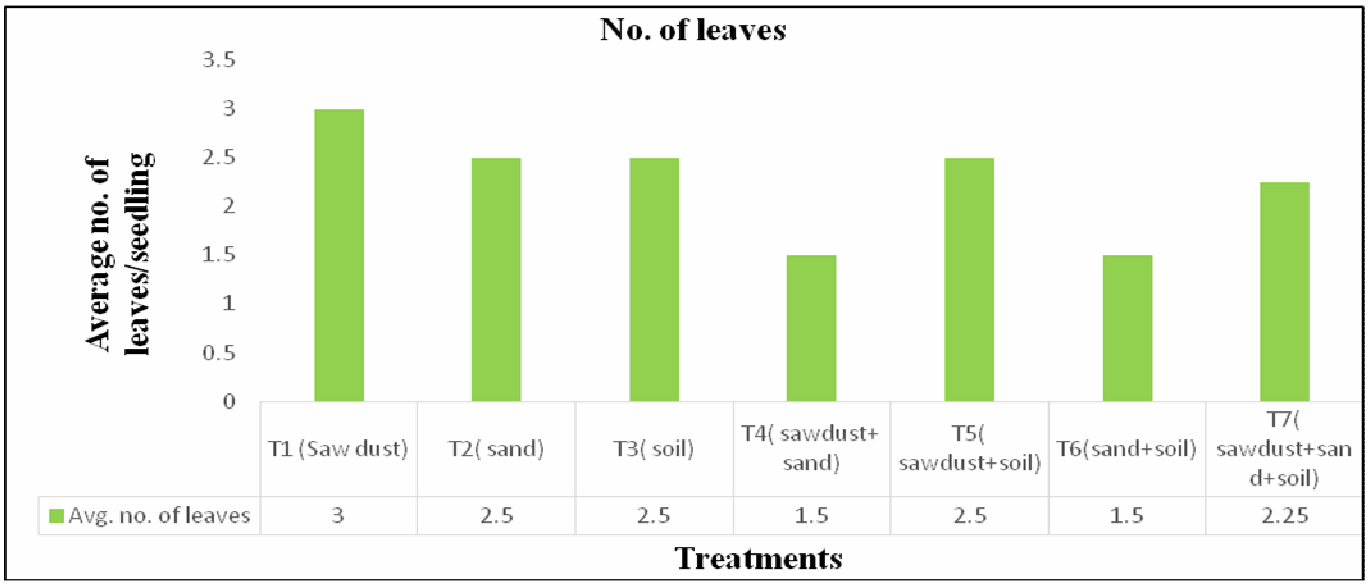

Fig. 5 : No of leaves after 10 days of sowing and after 20 days

Table 3 : Height of plants (cm)

Sl. NO	DAY5	DAY 10	DAY15	DAY 20	AVG. (cm)
T1	0	2.5	6.2	7.5	4.05
T2	0	1.5	4.0	4.5	2.5
T3	0	1.2	3.0	3.5	1.9
T4	0	0	1.5	2.8	1.0
T5	0	2.0	4.8	5.5	3.0
T6	0	0	3.2	4.4	1.9
T7	0	1.2	4.5	6.0	2.9

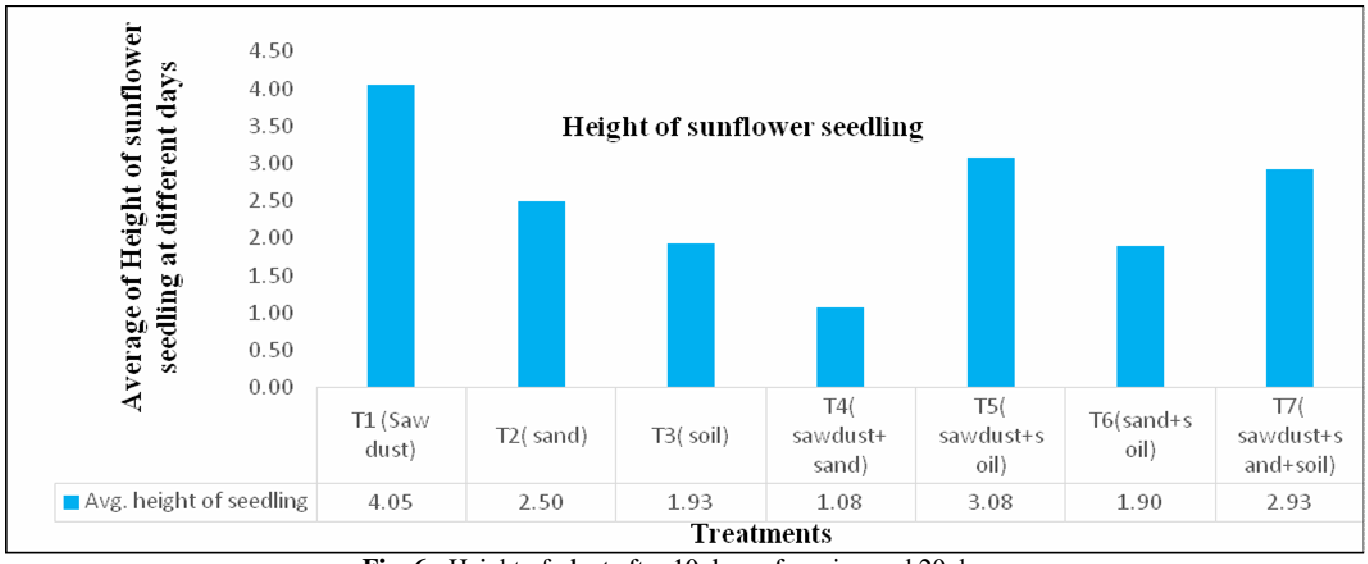

Fig. 6 : Height of plant after 10 days of sowing and 20 days

Table 4 : Length of Leaves (cm)

		Length of leaves (cm)			
Treatments	**Day 5**	**Day 10**	**Day 15**	**Day 20**	**Avg. length of leaves**
T1 (Saw dust)	0	2.5	6.5	7.5	4.12
T2 (Sand)	0	1.5	4	4.5	2.50
T3 (Soil)	0	1.2	3	3.5	1.92
T4 (Sawdust+ Sand)	0	0	1.5	2.8	1.07
T5 (Sawdust + Soil)	0	2	4.8	5.5	3.07
T6 (Sand + Soil)	0	0	3.2	4.4	1.90
T7 (Sawdust + Sand + Soil)	0	1.2	4.5	6	2.92

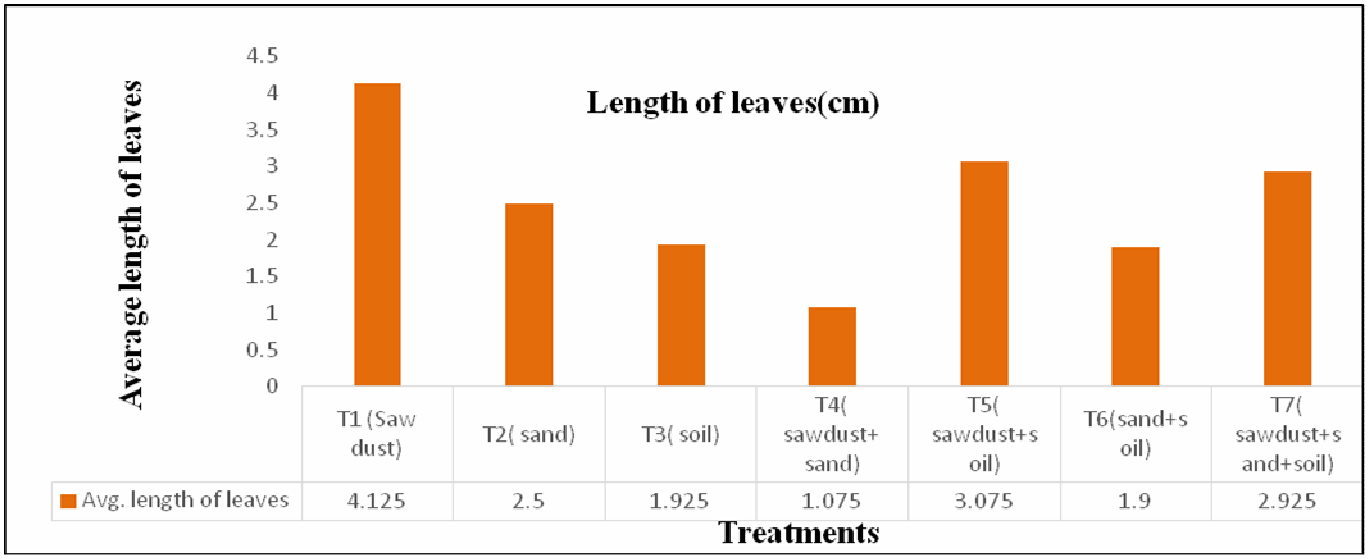

Fig. 7 : Length of leaves at 5, 10, 15 and 20 days.

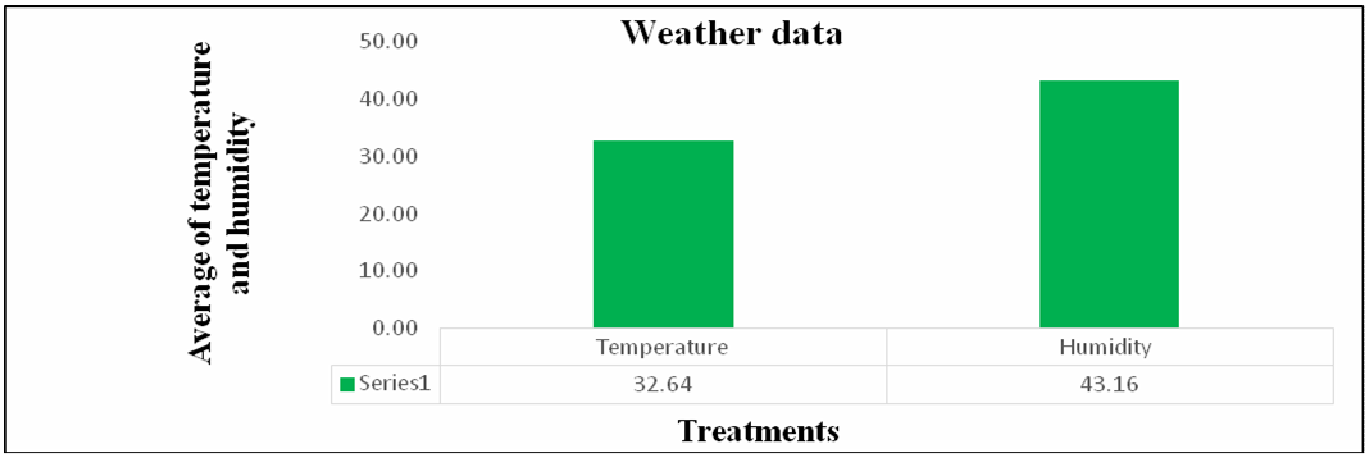

Fig. 8 : Weather data during the time period of experiment.

Effect of substrate on seed germination

For all the substrate the germination rates were below 90%, two weeks after sowing result showed that substrate of sawdust had the highest germination rates.

Germination performed significantly better on sawdust and soil than sand. On sand, sawdust + sand and sawdust + soil germinate, sawdust + sand + soil rates 63%, 55% and 60%, 68% respectively.

Based on the germination rate, the substrates are as follows:

Sawdust > soil > sand + soil > sawdust + sand + soil > sand > sawdust + soil > sawdust

Effect of sawdust on seed germination

Sawdust as a constituent of growth media of crop it was concluded that sawdust is a good growth media. Sawdust generally has a high percentage of air-filled porosity and low contact of available water, but this is affected by particle size.

Due to the low moisture retention irrigation must be applied frequently and is small quantities. The bulk density of dry sawdust is low at 124-154 g/L. Chemically it has neutral and moderately low pH (6.3-7.7) and very low EC. Sunflower thrives best in near neutral soil pH between 6.5

and 7.5.

Positive physical properties such as biodegradability at an acceptable rate low superficial specific gravity, high porosity, high water retention moderate drainage and high bacterial tolerance elevated and usage of sawdust as a plant growth medium.

Sawdust acts as a bulking agent allowing air into the panicle. Not many gardens know this but sawdust especially from hardwood like walnut tree. Is a natural weed killer.

The main effect of sawdust resulted significant increase in the plant height. The highest increase in the plant height in this treatment may be due to increase observed to available phosphorus and other

nutrients. Phosphorous promote the cell division which is in the plant height during vegetative growth.

Fig. 9: T1 (sawdust) having highest germination percentage as compared to other treatments

Conclusion

Under the aegis of Lovely Professional University, we started the experiment on the sunflower seedling growth in the different substrates on 22 Feb. 2020.

Layout of work has been prepared with 7 treatments. Treatment of trial was treated as T1: sawdust, T2: sand, T3: soil, T4: sawdust+ sand, T5: sawdust +soil, T6: sand + soil, T7: sawdust + sand + soil growth of sunflower. The experiment was conducted in a Polyhouse, where the seeds of sunflower type Sadabahar sunflower F-1 Hybrid were put to germinate in the polystyrene trays on substrates.

Germinating seeds were counted daily for a 15 days period. To estimate seedling emergence from two weeks after sowing up to four-week, data on seedling height and number of leaves were also recorded.

The result showed that germination started in 8 days after sowing for all the substrates. The highest germination rate was recorded on sawdust substrates (83%) while lowest rate (55%) on soil. Seedling on the sawdust substrates had maximum 5 numbers of leaves.

References

Andrew, R.L.; Kane, N.C.; Baute, G.J.; Grassa, C.J. and Rieseberg, L.H. (2013). Recent nonhybrid origin of sunflower ecotypes in a novel habitat. Mol Ecol. 22(3): 799-813.

Harter, A.V.; Gardner, K.A.; Falush, D.; Lentz, D.L.; Bye, R.A. and Rieseberg, L.H. (2004). Origin of extant domesticated sunflower in eastern North America. Nature. 430(6996): 201-205.

https://hort.purdue.edu/newcrop/afcm/sunflower.html

https://www.researchgate.net/publication/264552864_An_Introduction_to_the_Sunflower_Crop

https://www.researchgate.net/publication/283225252_Effect_of_substrates_on_germination_and_seedling_emergence_of_sunflower_Helianthus_annuus_L_at_the_Yongka_Western_Highlands_Research_garden_Paark_Bamenda_Cameroon_TROPICULTURA_33_2_91-100

https://www.researchgate.net/publication/326447711_EFFECT_OF_THE_USE_OF_SAWDUST_AS_A_GROWTH_MEDIUM_ON_THE_GROWTH_AND_YIELD_OF_TOMATO

Khaleghizadeh, A. (2011). Effect of morphological traits of plant, head and seed of sunflower hybrids on house sparrow damage rate. Crop Prot. 30(3): 360-367.

Kunduraci, B.S.; Bayrak, A. and Kiralan, M. (2010). Effect of essential oil extracts from oregano (*Origanum onites* L.) leaves on the oxidative stability of refined sunflower oil. Asian. J. Chem. 22(2): 1377-1386.

Muller, M.H.; Latreille, M. and Tollon, C. (2011). The origin and evolution of a recent agricultural weed: population/genetic diversity of weedy populations of sunflower (*Helianthus annuus* L.) in Spain and France. Evol Appl. 4(3): 499-514.

Seghatoleslami, M.J.; Bradaran, R.; Ansarinia, E. and Mousavi, S.G. (2012). Effect of irrigation and nitrogen level on yield, yield components and some morphological traits of sunflower. Pak J Bot. 44(5): 1551-1555.