

Deanship of Graduate Studies

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**The Effect of Cold Storage Treatment on The Germination of
Saffron corms in Palestine
Assessment of Biodiversity Knowledge, awareness and practices
case study in Palestine**

Rana Ali Hijawi

M.S.c Thesis

Jerusalem – Palestine

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Thesis Approval

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The names and signatures on the examining committee members are as follows:

1. Head of Committee: Prof. Dr. Jihad Abbadi Signature

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Fuad Rimawi

Jerusalem – Palestine

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Dedication

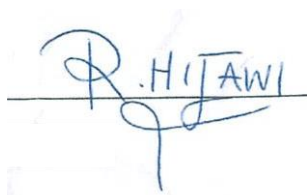
I dedicate this study to my parents, who have provided me with endless support and inspiration to cultivate a passion for science and exploration. Additionally, I extend my heartfelt dedication to our land, and to people who wander in search of beauty. To everyone who believes that we can protect this land and its skies despite all the challenges we face. May this paper be a source of inspiration towards saving our unique biodiversity.

Rana Hijawi

Declaration

I certify that the thesis submitted for the degree of Master is the result of my own research, except where otherwise acknowledged, and that this thesis (or any part of the same) has not be submitted for a higher degree to any other university or institution.

Signed: _____

A handwritten signature in blue ink, appearing to read 'R. HIJAWI', written over a horizontal line. The signature is stylized and includes a vertical flourish extending downwards.

Rana Ali Hijawi

Date: 10/8/2024

Acknowledgment

I would like to express my heartfelt gratitude to my parents and brothers, my source of joy and inspiration for their support and encouragement during my journey.

Rana Hijawi August, 2024

Abstract

Palestine holds a great deal of biodiversity, including an extensive variety of wildflowers. This study aims to find the optimum storage conditions for saffron corms, enhancing cultivation and yield potentially leading to economic and conservation benefits for different native plants. The practical aspect of this study covered storage of 81 saffron corms of two different sizes at three different temperature treatments of (5 °C,10 °C,25 °C) for a duration of 5 weeks before planting in garden settings following a randomized complete block design (RCBD) comprising three blocks. The saffron flowers were assessed based on four criteria including germination rate and flowering success, leaf length, flower production and morphology and saffron yield. The most significant growth, flower production and saffron yield was seen in saffron corms stored at 25 °C followed by 10 °C and finally 5 °C. Corms stored at 5 °C produced short wrinkled leaves as well as few flowers; hence, few stigmas. Highlighting the positive relationship between moderate temperatures and saffron cultivation, in contrast with the negative impact of cooling pretreatment on the growth and development as well as yield of saffron unlike other cormous plants which require cooling to break dormancy. Additionally, larger corms yielded more saffron as compared to smaller corms when stored at the same temperature conditions, results which align with previous studies and shed a light on the possibility of utilizing optimum conditions to locally cultivate more native plants as well as saffron in central regions of the West bank.

In the second portion of this study, a knowledge assessment survey was conducted in the West bank with the aim of understanding public knowledge, awareness and practices towards nature. The data collected from 385 respondents over a period of 3 months through a structured survey was analyzed on SPSS. This portion of the study emphasizes the need for systematic and aimed conservation strategies based on demographic- specific information to enhance and sustain community engagement and effective policies.

According to the survey there was a positive correlation between knowledge in biodiversity and engagement ($r=0.580$, $p=0.01$), knowledge and positive behavior ($r=0.571$, $p=0.001$), as well as engagement with nature and positive behavior ($r=0.635$, $p=0.001$), the findings highlight the need for educational programs that enrich knowledge in individuals in order to encourage better attitudes and sustainable engagement for the future of biodiversity conservation.

List of Abbreviations

RCBD: Randomized complete block design

EQA: Environmental Quality authority

NGO: Non-governmental Organization

PIBS: Palestine Institute of Biodiversity and Sustainability

PCBS: Palestine Central Bureau of Statistics

SD: Standard Deviation

SPSS: Statistical Package for the Social Sciences

ANOVA: Analysis of Variance

Chapter One

Introduction

1.1 General Introduction

(*Crocus sativus L.*) commonly known as saffron, is a member of the Iridaceae family. Saffron is known for its dried red stigma and is widely cultivated in countries like Iran, Greece, as well as many parts in the Mediterranean region. It is packed with 150 aromas producing compounds and has a wide variety of medicinal uses such as an antigenotoxic agent, antihypertensive, antidepressant, and relaxant. Additionally, Saffron has also been associated with improvements in memory and learning skills. (Srivastava et al., 2010)

Saffron flowers bloom in autumn bearing vibrant attractive flowers, they bloom annually within a narrow time frame for 3-4 weeks in October/November. Morphologically, each flower contains three stigmas connected to the carpel. The morphology of saffron flowers is shown in *Figure 1*, the plant is frequently dried and used as a spice or coloring agent. (Cicco, 2022)

There is an increase in demand for saffron, as nowadays it is used in cosmetics and personal care products, with the highest market demand for saffron found in the middle east Africa region with a market size value of 602.2 million USD in 2023. (Saffron market size, 2023).

In the occupied territories, specifically in 2021 exports reached 2.72 USD to regions like Ireland, Iceland, France and Australia.

Saffron growth is impacted directly by temperature as it is the main factor that determines shoot growth, flower initiation and emergence. (Molina & et al., 2004) Contrary to other geophytes saffron does not need a period of cooling to break its dormancy (Begoña Renau-Morata a et al., 2021). Warm intermediate temperatures, temperatures range (23-27 °C) is required to break bud dormancy and for flower initiation. (Molina & et al., 2005).

This paper analyses the effect of pretreating crocus corms with different temperatures on germination, growth and saffron yield. This will allow for formulating a method which people can use to grow the corms themselves in garden settings. As well as potentially saving other wild geophytes from endangerment.

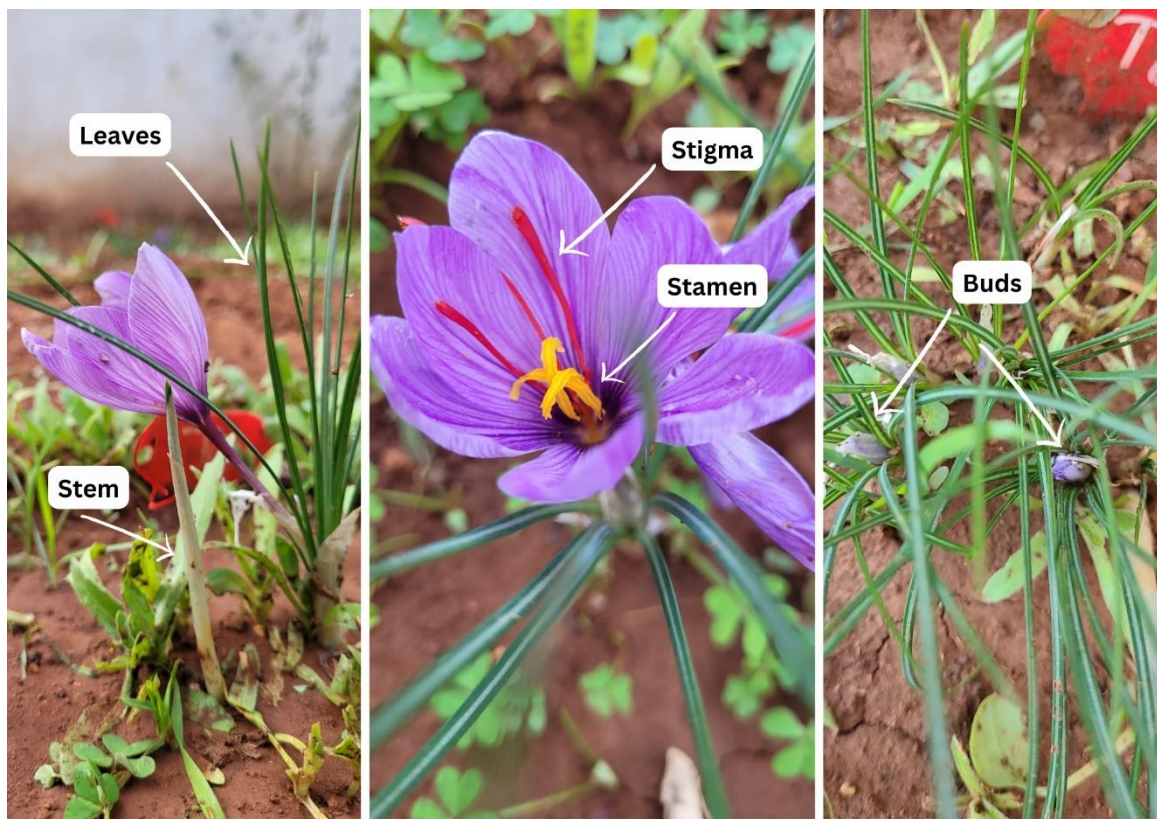


Figure 1.1: Morphology of Saffron Flowers Used in This Research

Habitat change worldwide due to urbanization and colonization has led to native plant species being completely wiped out with no consideration for ecological consequences.

(Seto, 2012). Biodiversity is a term that comprises the diversity of different life on earth including plants, animals, microorganisms, the genes they contain and the ecosystem they form. (Agarwal, 2015). In Palestine, the EQA (Environmental Quality authority) is responsible for turning knowledge in nature to policies in collaboration with governmental, nongovernmental organizations (NGO) and academic sectors. According to the 6th national report there is a little integration of biodiversity values in the mainstream society. (6th National Report for the Convention on Biological Diversity, 2021).

Although many organizations have based their work on raising awareness towards Biodiversity, many have suggested that there are uneven development indicators which overall hinder sustainability of programs and policies, this study offers a way in which the impact of awareness campaigns can be increased through assessing the community's knowledge, awareness and practices towards biodiversity.

The challenge for conservation is now a global problem. Despite all of the challenges, Palestine faces either globally like climate change or locally like the occupation which continues to cause deterioration of nature either by pollution, or segregation of land the act of raising awareness and seeking more efficient ways of making a sustainable impact is the goal of many local institutions such as the Palestine Institute of Biodiversity and Sustainability (PIBS) and many more. (Qumsiyeh, 2023)

Given the role of humans in the deterioration of biodiversity, globally many strategies aimed toward conservation are headed towards fostering community awareness. One way is to build indicators that assess community's perception and behavior, this can aid in refining strategies and design better awareness campaigns. (Fielding et al., 2023) Palestine's status in terms of biodiversity knowledge among individuals within the community has not been widely assessed. Collecting such data can greatly influence impactful projects aimed to

preserve the unique biodiversity by understanding individual's awareness and practices towards wildlife.

Identifying native plant types and incorporating them into scientific research and agribusiness holds immense significance for various reasons as native plants play a crucial role in ecosystem stability and biodiversity conservation and a hold great value as a symbol of culture and resilience specially for Palestinians threatened of identity theft on daily-basis constantly.

1.2 Study Objectives:

- 1- To assess the effect of temperature pre-treatment on saffron corm growth, development and yield.
- 2- To conserve rare and endangered native flowering plants in Palestine through growing knowledge in propagation methods.
- 3- To develop key indicators for better awareness campaigns covering biodiversity in Palestine.

Chapter Two

Literature Review

2.1 Iridaceae Family

Also known as the Iris family, the family comprises perennial rarely annual herbs or shrubs. With stems that from as rhizomes, corms, bulbs or woody caudex all of which serve a roll in vegetative propagation and nutrient storage needed for growth. The leaves are characterized as unilateral with veins in parallel arrangement. The flower inflorescence in this family can be in a form of a flower cluster (Spathe), or as singularly supported flowers (Pedicellate), or with the ovary attached above or below floral parts (epigynous or hypogenous respectively). (Simpson, 2010)

In Palestine there are 34 flowers that belong to the Iridaceae family, many of which are either protected or currently endangered, among these flowers is the national flower of Palestine, *Iris hynei* (سوسن فقوعة) which thanks to conservation efforts led by academics, researchers and the Palestine wildlife society is currently at lower risks of endangerment; however, other members of this family are currently not monitored or documented many of which are actively wiped with the expansion of urban areas examples include (*Crocus hermoneus*), (*Crocus cancellatus*), (*Iris mesoptamica*), according to the wildlife organization based in

Bethlehem, many of which are classified as rare, protected or even endangered species due to the increased occupation of land and urbanization. (AlSheikh & Qumsiyeh, 2022)

2.2.1 Origin of *Crocus Sativus* L.

Crocus sativus L. also known as saffron or sometimes referred to as ‘red gold’ a name granted because of its high value due to its labor-intensive harvesting requirements as well as its incredible medicinal worth. (Leone et al., 2018) Historically, the name saffron stems from the Arabic word ‘Zafaran’ which pertains to the color yellow. (Cardone et al., 2020). Saffron domestication may have originated in the middle east in 1951 while other scholars suggest its origins from ancient Greece (Mzabri et al., 2019).

The flowers of the genus *crocus* are well known for their beautiful colors including violet, white and yellow commonly used to embellish gardens during autumn. *Crocus sativus* the subject of this study is used for its red stigma which when dried forms saffron, the most expensive spice in the world. (Jelena B, et al. 2021). This species does not grow naturally in the wild in Palestine but can easily be cultivated as these flowers flourish for the Mediterranean environment.

Plants native to Palestine that belong the same genus (*Crocus*) can be a great subject for future research either as antidepressants or natural dyes for food or cosmetic products after being conserved from being endangered or rare.

2.2.2 Botanical Description

Saffron (*Crocus sativus* L.) is a perennial plant that belongs to the Iridaceae family. It is well known for its brightly colored stigmas used as spices in many regions of the world. The saffron crocus is considered a geophyte, which means a plant that possess underground storage organs for food and energy. Geophytes include plants with corms such as saffron or

rhizomes such as those seen in Iris flowers. Both these storage organs serve a roll in the process of vegetative propagation which is a form of asexual reproduction for plants of the Iridaceae family where new plants arise from vegetative structures such as roots, stems or leaves, granting these plants with rapid and clonal expansion. (Mzabri et al., 2019).

The leaves are narrow and linear which is a characteristic of monocots. Their flowers have six petals and are brightly purple to lavender colored. The red orange stigmas are harvested during blooming season and possess aromatic properties constituting for their use as a spice.

Figure 1 shows the structure of saffron corms and flowers.

2.2.3 Saffron Propagation

Propagation of saffron has relied on traditional and sustainable practices using available resources as it can thrive in low-input cropping systems, the increase in demand requires supplementation with new technologies in order to maintain its value. Modernized production methods include propagation under controlled environments as seen with examples of hydroponics and aeroponics, where temperature, light and humidity are all monitored. The former method involves growing saffron in a static or flowing nutrient solution; while the latter the aeroponic system involves utilizing a mist to supply the plant's roots with nutrients. Another example is the use of growth chambers, with conflicting studies about their effectiveness in influencing the quality and yield of saffron. Moreover, in vitro cultivation provides another controlled environment technique for propagation through the use of tissue and cell culture methods which provide large-scale propagation as well as genetic development. (Khajeh-Hosseini & Fallahpour, 2020)

In this research the traditional method of growing saffron was adapted, traditionally saffron requires full sun, in early fall with spacing of 10-15 cm between corms, and 10-15 cm in depth, with the pointed side set upwards. Saffron corms are often threatened by rodents and

beetles; therefore, it is important to take precautions such as avoiding planting edible tubers and bulbs near them. Since saffron crocus is a low maintenance and drought-tolerant plant it does not require extensive water supply; however, it is best to be watered deeply in case of extended dry periods. (Greer, 2019)

2.2.4 Flower Development

The most valuable component of saffron is the flower. Saffron flowers contain both male including three stamens that produce pollen and female parts with three stigmas. Temperature is the main factor that affects shoot growth, saffron flower initiation and emergence. Saffron does not require a period of cold to break its dormancy contrary to other geophytes. (Dole, 2003) High temperature is required to break the dormancy of flowers with an optimal temperature of 23-27 °C. (Molina et al.2004)

2.2.5 Harvesting and Storage

Saffron yield and quality is greatly affected by many preharvest and postharvest activities. Harvesting saffron is a labor-intensive process which mainly constitutes to its high price in the market. During the blooming season the stigmas are handpicked from fields. Since saffron cultivation relies on manual labor, specifically harvesting and separation of stigma. Some mechanization efforts can be made but are also limited due to the delicate nature of the crop. The use of smart farming which encompasses modern technologies such as IoT, sensors and precision equipment are being explored with the aim of optimizing saffron cultivation. (Khajeh-Hosseini & Fallahpour, 2020)

Post harvesting the stigmas also requires special care, drying the stigmas plays an important role in determining the quality of saffron including its physiochemical properties as well as economical value. Drying is considered a critical step in order to preserve saffron aromatic

properties which arise from safranal. A fresh stigma cannot contribute to additions to food, because the drying process is responsible to give rise to the physical, chemical and biochemical changes needed to achieve Saffron's qualities.

Dehydration treatments can vary for example drying saffron at room temperature yields saffron with far less quality as well as color than drying at high temperatures with the former possessing less safranal, the aromatic substance. Safranal starts to form at temperatures of 70-90 °C, additionally the process aims to stop the enzymes responsible for biodegradation. Moreover, air drying also works to preserve the color of saffron preventing it from degradation which can result from solar contact as carotenoids degrade, conserving its color and aroma. (Manuel et al., 2005)

After flowering season, saffron enters a period of dormancy, the corms remain alive and store nutrients.

2.2 Biodiversity in Palestine

Biodiversity encompasses the wide range of life forms on Earth including plants, animals and microorganisms as well as the genetic diversity they possess and the ecosystems they form. There is a direct relationship between native species richness and ecosystem health highlighted by the crucial role biodiversity plays in supporting healthy soil formation, regulation of biochemical cycles, and mitigating pollutants. (Agrawal et al., 2015)

Palestine serves as a bridge between Africa and Eurasia, with its unique geographic location it also has different topography spanning five geographical zones including central highlands, semi coastal region, eastern slopes Jordan rift valley and coastal regions. The variation in topography gives rise to an array of diverse flora and fauna in Palestine. (Qumsiyeh & Abusarhan, 1985)

According to a statistical report done by EQA and published in 2020 by the Palestinian central bureau of statistics, about 2750 species were identified in historic Palestine within 138 families, in the West bank and Gaza there are 2076 plants species documented so far, in the West bank region 391 of these plants are considered rare and comprise 20% of the total plant species population in Palestine. In addition to 68 plants classified as very rare. The Gaza strip was home to 155 rare species, in addition to 22 being very rare. (Pcbs, 2020)

The subject of this study, *Crocus sativus L.* which belongs to the iris family does not grow in Palestinian nature but can be cultivated; nonetheless, there are ten identified native flowers that belong to the same genus crocus in Palestine which vary in status between rare and endangered. These species include: *Crocus hermoneus subsp.palaestinus* , *Crocus hyemalis*, *Crocus pallasii*, *Crocus aleppicus* which are mainly found in hilly areas of central highlands and the upper Jordan valley. The rest of the species are known to grow in historic Palestine.

Figure 2 shows identified native crocuses recorded in Ramallah growing naturally.



Figure 2.1: Different Native Crocus Species Documented in Ramallah Growing Naturally, (A) Winter Crocus (*Crocus Hyemalis*) (B) Palestine Saffron Crocus (*Crocus Hermoneus Subsp.Palaestinus*) (C) Crocus Aleppo (*Crocus Aleppicus*) (D) Field of Crocuses. (Photos Taken by the Author)

Crocus hermoneus subsp.palaestinus, which is a subspecies that carries the name Palestine, has records of threats due to urbanization and habitat destruction. (Shtayeh' & Jamous, 2018) These crocus flowers have been recorded in great quantities over several spots in Ramallah city specifically in an urban area. The inspiration behind this research came from a field shown in *Figure 2* where several crocuses were documented. However, the area was turned into a construction site leading to the removal and destruction of crocus corms as well as many other native flowers including Steven's Meadow Saffron, butterfly orchid, spider orchid, butterfly orchid and Barbary nut documented in Ramallah as shown in *Figure 3*. This action pushes more of these plants towards endangerment day by day. According to the environment quality authority (EQA) the greatest threats faced by environment in Palestine include habitat fragmentation due to urbanization, colonization and climate change. (El Shaer et al., 2015)



Figure 2.2 Native Plant Species Documented In Ramallah (A) Steven's Meadow Saffron (*Colchicum Stevenii*) (B) Pink Butterfly Orchid (*Anacamptis Papilionacea*) (C) Carmel Bee-Orchid (*Ophrys Umbilicata*) (D) Barbary Nut (*Moraea Sisyrinchium*) (Photos Taken By The Author)

The aim of exploring the biodiversity aspect in this paper is to try to mitigate from the damage caused urbanization and colonization in Palestine, land is actively being destroyed wiping plants and wildlife that rely on their presence. Two key actions to counteract these threats is to develop indicators towards societal biodiversity knowledge in order to design and refine awareness campaigns, secondly cultivate wild plants outside their natural settings by individuals from the whole spectrum of society and not exclusively individuals from a scientific background.

2.2.5 Conservation Efforts of Rare and Endangered Native Plants

The presence of native plant species in an ecosystem can be used as an indicator for an environment's health. According to a study done by the Palestine institute of biodiversity and sustainability (PIBS) conservation efforts have included in situ and ex situ efforts, the former pertains to actions done at the same native land as done in protected areas with priority to area with the highest degree of endangerment, or enhancing legislations within that same region. Ex situ conservation efforts on the other hand, include constructing seed banks and well-managed botanical gardens. (AlSheikh & Qumsiyeh, 2021)

Due to occupation only 8 out of 49 protected areas sought to be approved by the Palestinian ministerial committee are under full Palestinian control, while the others fall in area C controlled by the occupation or overlapping regions making in situ conservation efforts more difficult. (Qumsiyeh & Amr, 2015)

In a study on red list biological trails, there was no relationship between biological trails and a plant's rarity and need for conservation which implies that red list value may not directly show conservation needs for a species, Some of the native plants classified as critically endangered in the study were *Crocus palaestinus* , *Iris haynei*, *Arum negevense kollmann*. (Shtayeh & Jamous, 2018) The former plants are geophytes that can grow in the wilderness,

taking into account all these efforts this paper will present a method of conserving bulbous native plant species ex situ. Some of these native plant species recorded in Ramallah are shown in *Figure 3*.

Conservation efforts also took form in the designation of the Fuquoa (*Iris haynae*) as the national flower of Palestine as well as the Palestine sunbird (*Cinnyris osea*) as the national bird in 2016 by the environmental quality authority (EQA) along with academics and researchers, which not only highlighted their title as national symbols but also raised awareness towards biodiversity overall.

2.3 Economic Value

The purpose of discussing the economic value of saffron corms is to unlock a potential innovative and conservational opportunity. *Crocus sativus L.* as the source of saffron has been known for its value in the culinary world for its flavor and aroma; nonetheless, it also possesses other uses and benefits including medicinal, cosmetic as well as its use in dye and pigment production. For instance, in the cosmetic industry, saffron extract is included in skincare products for its anti-aging and skin-brightening benefits. (Duval, 2024) Additionally, saffron is used in perfumery in Asia possessing a honey-like smell and having the ability to blend well with various scents, in the west synthesized rather than the natural Safranal is used due to availability and cost. (Camps, 2008)

Moreover, Saffron extract was found to reduce depression in healthy individuals as well as improving heart rate variation in response to stress, suggesting it can enhance resistance against stress-induced disorders. (Jackson et al., 2021)

In Palestine, the retail price for saffron is approximately 3,124 USD per kilogram depending on the quality. On average a gram of high-quality saffron costs 4.5 USD, with prices fluctuating based on demand and availability. (Qayen, 2024) A successful experience by a

farmer Jaber Bani Taha in southeast Nablus, who began saffron cultivation in 2016 despite the challenges summarized in lack of corm sources, limited experience and financial constraints has cultivated saffron and yielded. In 2022, harvested 500 grams of saffron selling each for 10 USD. His experience not only led to economic impact but also increased knowledge among locals on saffron corm cultivation. Typically, the number of flowers produced depends on the size of the corm the first year of cultivation only 50% of the corms produce flowers, one large corm can produce 2-4 flowers if the conditions are right. Each saffron flower contains 3 stigmas which are harvested as saffron thread, about 167 flowers are needed to produce 1 gram of dried saffron threads. (Skinner et al., 2020)

Despite challenges, saffron cultivation can add vast opportunities for the Palestinian community driven by innovation and expanding market demand. In this frame specifically it can inspire other farmers and researchers to apply cultivation knowledge to native wildflower bulbs for better conservation efforts. Researchers and academics can incorporate saffron as well as other native plants in the field of medicine, cosmetics and pigment manufactory.

2.4 Awareness Status in Palestine

According to the sixth national report, a survey done on 12 key stakeholders distributed evenly across academia, nongovernmental organizations and governmental organizations, the respondents classified the level of environmental knowledge within the Palestinian society from average to good with potential for improvement. The awareness of biodiversity in Palestine has notably improved between 2010 and 2020 as a result of efforts led by governmental bodies such as the environmental quality authority, academics from universities and biodiversity centers such as the Palestine institute for biodiversity and sustainability (PIBS) at Bethlehem university as well as nongovernmental organizations.

This growth in knowledge and awareness is due to activities reported such as trainings in environmental work for a large number of individuals led by academia and NGO. For instance, PIBS at Bethlehem university has trained over 7000 individuals in environmental work between 2015 and 2020. The number of individuals benefiting from such training varies among institutions but according to this survey an estimate of more than 70,000 individuals benefited from extracellular environmental education programs from 2015 to 2020. (State of Palestine | sixth national report 2021)

Despite the advancement in Biodiversity knowledge since the 5th national report of biodiversity, there still needs to be an effort to understand the behaviors, attitudes and knowledge of individuals through more extensive and inclusive surveys. These efforts can lead to more efficient conservation methods and optimized involvement of the Palestinian society with the former stakeholders including governmental sectors, NGO and academia. The status of biodiversity awareness in Palestine has not been assessed for a large group from different ages and across a wider spectrum, the goal of this study is to gain an insight to the consciousness of individuals towards biodiversity in Palestine for the same objective of enhancing biodiversity conservation efforts.

It is worth noting that Palestine follows the Aichi biodiversity targets as a reference led by the EQA in collaboration with academia and NGO, Aichi -T1 Awareness of biodiversity values, Aichi- T19 Biodiversity knowledge, Aichi – T9 invasive species, Aichi- T5 Loss of habitats are all relevant points for this study. The first target encompasses an important aspect for building any sustainable project related to wildlife conservation, Aichi – T1 has two main goals: to educate individuals about the critical value of biodiversity, and to encourage them to consider how to preserve and sustain it. This strategy is implemented through establishing environmental media platforms, creating innovative and effective educational curricula and

activities additionally promote concepts for environmental values and practices. (EQA, 2021)

2.5 Previous Studies

Previous research done in Spain in an open field have looked into the effect of thermal pretreatment of saffron corms and have found that storing corms at 30 °C for 45 days has led to an overall increase in yield of saffron compared to colder storage at 10 °C and 17°C. (Gómez et al. 2002). Researches done using temperature as a factor for pretreatment of corms are known to answer three questions, to find the optimum temperature for growth, what is the duration for incubation, should storage organs (corms) be planted during moist and cold periods or unplanted (dried and stored). Research approaches towards geophytes can be done to serve a commercial or scientific value for example increase the yield of saffron or ornamental flowers for a florist. (Dole, 2003)

Another research an agroeconomic aimed to interfere with saffron harvesting period in order to minimize the workforce needed, found that cold treatment denoted as (thermal forcing) of the corms led to significant decrease stigma yield as well late flowering. (Mzabri et al., 2021)

Wildflowers are a fundamental part of the natural heritage of Palestine. Previous studies on the status of rare plant species and Flora biodiversity have been done before (Pahl & Qumsiyeh, 2021); nonetheless, a methodology for cultivating wildflower species opens horizons to adding a new economic value for these plant species, and offers future research to integrate wild plants in the field of agriculture as well as conserve species not only in the form of a seed bank but also as blooming flowering bulbous plants supporting the ecosystem. The analysis of patterns of variation in plant identification knowledge in an area with a sample population of different age, educational level and place of residence can provide valuable insights for designing educational and engagement strategies. One approach is to

focus on specific segments of society that have the lowest levels of knowledge. Additionally, shaping awareness and education campaigns aimed at minimizing their negative effects. (Robinson et al., 2016)

PIBS conducted a survey which included 50 participants to understand the public's understanding of biodiversity and protected areas, it revealed that 46% reported having extensive knowledge of biodiversity, 50% reported limited knowledge, and 2% reported no knowledge at all. Individuals in this study group suggested two main strategies for boosting environmental awareness including the incorporation of biodiversity knowledge in school and university curricula and discussing environmental topics and issues on media platforms. (EQA, 2021)

Chapter Three:

Materials and Methods

3.1 Acquiring and Preparing (*Crocus Sativus L.*) Corms

For the sample used in this experiment, 81 dried saffron corms were acquired from a local saffron cultivator who is among the only individuals with expertise in saffron cultivation. *Crocus sativus L.* corms were transferred in mesh bags to Ramallah where they were initially sorted based on size. Specifically, 33 large corms of a diameter of 4.5-5 cm, in addition to 48 small corms with a diameter of 2.5-3 cm. *Figure 4* shows all the corms post-treatment sorted and ready for planting.

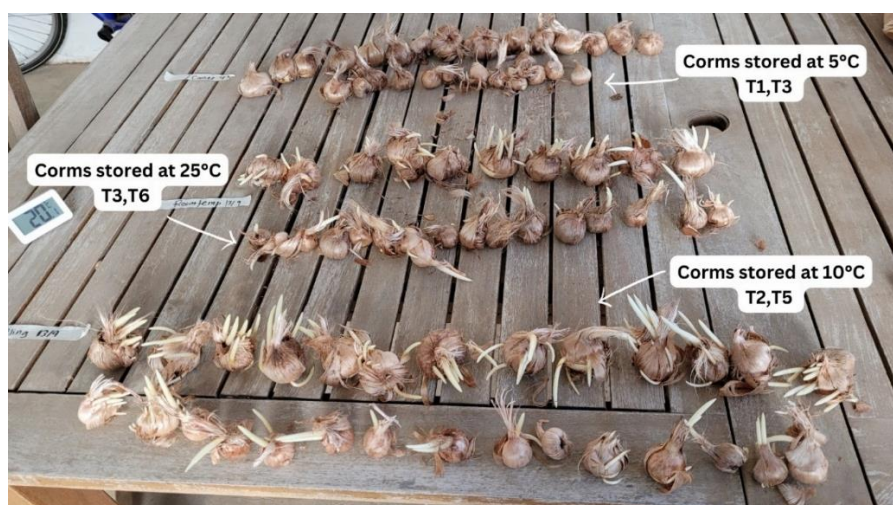


Figure 3.1: Saffron corms post 5-week treatment ready for planting

3.2 Treatment of the Corms

The corms were set in paper bag *Figure 5* under varying temperature treatments before planting. The treatment duration started on September 13th 2023. The temperature treatments for the corms were 5°C ,10°C and 25°C room temperature set as the control. There were 6 unique treatment combinations with respect to size and temperature Treatment 1 small corms stored at 5°C, Treatment 2 small corms stored at 10°C, Treatment 3 Small corms stored at 25°C, Treatment 4 large corms stored at 5°C, Treatment 5 Large corms stored at 10°C , Treatment 6 large corms stored at 25°C. The cooling period was 5 weeks lasting to October 18th 2023. Digital thermometers were used to monitor the temperature during the treatment period. 5 weeks is the minimum chilling period for saffron corms in order to avoid their damage during the study.



Figure 3.2: Paper bags used to store the corms for cold treatment for 5 weeks when they were taken out and prepared for planting.



(a) Corms after cooling at 5 °C
(T3,T1)



(b) Corms after cooling at 10 °C
(T4,T2)



(C) Control corms stored at 25 °C
(T3,T6)

Figure 3.3: Corms post-Treatment Period of 5 Weeks

3.3 Experimental Design

The experimental design followed a randomized complete block design with six unique treatments Table 1 shows the distribution of the corms in terms of treatment. A rectangular block measuring 4m² was prepared in September 19th 2023 as show in *Figure 7* , the area was divided into three blocks with each block containing 27 corms. After the treatment period was done for five weeks at different temperature settings. The Saffron corms were placed in the blocks according to the design, corms were spaced 10 cm apart, the depth in which the corms were planted was 10 cm. Treatments 1-3 had 11 replicates while Treatments 4-6 had 16 replicates, distributed in the three blocks following RCBD.



Figure 3.4 Preparation of experimental design following RCBD (a) Treatment labels and partitioning (b) Initial area measuring 4 square meters (c) the area recorded in November after 1 month

Table 3.1 - A: The experimental design following RCBD with Treatments used and their description. 6 unique treatment combinations with respect to size and temperature T1 (S, 5°C), T2 (S,10°C), T3 (S, 25°C), T4 (L, 5°C), T5 (L, 10°C), T6 (L, 25°C). Total experimental units = (27 x 3) = 81 experimental units

Block 1	Block 2	Block 3
T2 (S,10°C)	T1 (S, 5°C)	T5 (L, 10°C)
T6 (L, 25°C)	T6 (L, 25°C)	T2 (S,10°C)
T1 (S, 5°C)	T5 (L, 10°C)	T3 (S, 25°C)
T5 (L, 10°C)	T2 (S,10°C)	T4 (L, 5°C)
T4 (L, 5°C)	T3 (S, 25°C)	T2 (S,10°C)
T6 (L, 25°C)	T1 (S, 5°C)	T6 (L, 25°C)
T3 (S, 25°C)	T4 (L, 5°C)	T1 (S, 5°C)
T5 (L, 10°C)	T3 (S, 25°C)	T3 (S, 25°C)
T1 (S, 5°C)	T2 (S,10°C)	T5 (L, 10°C)

Table 3.1 - B: The experimental design following RCBD with Treatments used and their description. 6 unique treatment combinations with respect to size and temperature T1 (S, 5°C), T2 (S,10°C), T3 (S, 25°C), T4 (L, 5°C), T5 (L, 10°C), T6 (L, 25°C). Total experimental units = (27 x 3) = 81 experimental units

T4 (L, 5°C)	T6 (L, 25°C)	T1 (S, 5°C)
T2 (S,10°C)	T1 (S, 5°C)	T3 (S, 25°C)
T4 (L, 5°C)	T3 (S, 25°C)	T5 (L, 10°C)
T6 (L, 25°C)	T6 (L, 25°C)	T1 (S, 5°C)
T1 (S, 5°C)	T3 (S, 25°C)	T6 (L, 25°C)
T3 (S, 25°C)	T2 (S,10°C)	T2 (S,10°C)
T5 (L, 10°C)	T1 (S, 5°C)	T5 (L, 10°C)
T2 (S,10°C)	T3 (S, 25°C)	T1 (S, 5°C)
T4 (L, 5°C)	T4 (L, 5°C)	T1 (S, 5°C)
T1 (S, 5°C)	T1 (S, 5°C)	T2 (S,10°C)
T3 (S, 25°C)	T6 (L, 25°C)	T2 (S,10°C)
T2 (S,10°C)	T4 (L, 5°C)	T3 (S, 25°C)
T3 (S, 25°C)	T2 (S,10°C)	T4 (L, 5°C)
T6 (L, 25°C)	T5 (L, 10°C)	T6 (L, 25°C)
T1 (S, 5°C)	T2 (S,10°C)	T1 (S, 5°C)
T3 (S, 25°C)	T4 (L, 5°C)	T2 (S,10°C)
T5 (L, 10°C)	T3 (S, 25°C)	T3 (S, 25°C)
T2 (S,10°C)	T5 (L, 10°C)	T4 (L, 5°C)

3.4 Evaluation Criterion

Several factors were taken into consideration upon the evaluation of the effect of cold treatment on saffron, these factors are: the viability and germination rate, growth rate, saffron yield and flower production.

1. **Germination Rate and Flowering Success:** a comparison between the six unique treatments was done on which corms succeeded in producing leaves whether the cold treatment effected corm viability, and the percentage of flowers produced.
2. **Leaf Length and Timing as Indicators for Development Rate:** the length of saffron leaves was measured and compared over a period of 2 weeks and 3 months.
3. **Flower Production and Physical Characteristics:** How many flowers were produced after germination for each treatment.
4. **Saffron Yield:** The most valuable part of saffron are the stigmas, the quantity of saffron collected from the saffron corms subjected to different treatments were also compared to analyze the optimum settings for storing saffron.

All of the former factors give us indicators to formulate the optimum conditions to grow saffron in our region.

3.5 Survey Assessing Societal Biodiversity Knowledge

A survey was constructed covering three axes to assess the overall knowledge, awareness and practices done on a random population in the West bank region. The question would allow the formulation of indicators to better design awareness campaigns and target individuals for sustainable biodiversity conservation action in the region. The three axes revolved around general knowledge, awareness and practices covered in 30 questions presented in *tables 3-5 Appendix 2*, the analysis and comparison are based on population demographics including age, gender, place of residence and degree of education. The

targeted audience were students, educators and individuals from the working class. The population of the West bank reached an estimate of 3.05 million, the population to be studied comprises individuals of age 14 and above, which is estimated to be 1,875,931 amounting to 63 % of the West bank population (West Bank Age Structure 2020). For reliability a sample size calculator was used to estimate the number of surveys that need to be collected for the purpose of this study amounting to 385 surveys with a confidence level of 95%.

3.6 SPSS Evaluation of survey analysis method

Sample Demographics

Of the 385 respondents, 200 (51.9%) were female and 185 (48.1%) were male. The respondents varied according to residence with two main group of urban areas 255 (66.2 %), and 128 (33.2%) in rural areas. Educational levels varied as well, with 32 (8.3%) still in school, 22 (5.7%) having a high school degree, 219 (56.9%) possessing a bachelor's, 88 (22.9%) having a master's degree, and 24 (6.2%) having a doctoral degree. The mean age of the respondents was 2.35 (Standard deviation, SD=1.181). The data was tested for reliability on SPSS with Cronbach's alpha = 0.753 which is considered acceptable. Table 7 Appendix 3 ; additionally the data was normally distributed assessed using normality test presented in *table 8 Appendix 3*.

Survey and Measures

Initially the survey was divided into three sections with 10 questions each further analysis included the computation of six dimensions including knowledge, engagement, perception, positive and negative behaviors as well as gardening practices. For each aspect the answers ranged from 0 to 5, survey included in *Appendix 2*. The scores were compared to percentages for comparison *Figure 3.5*.

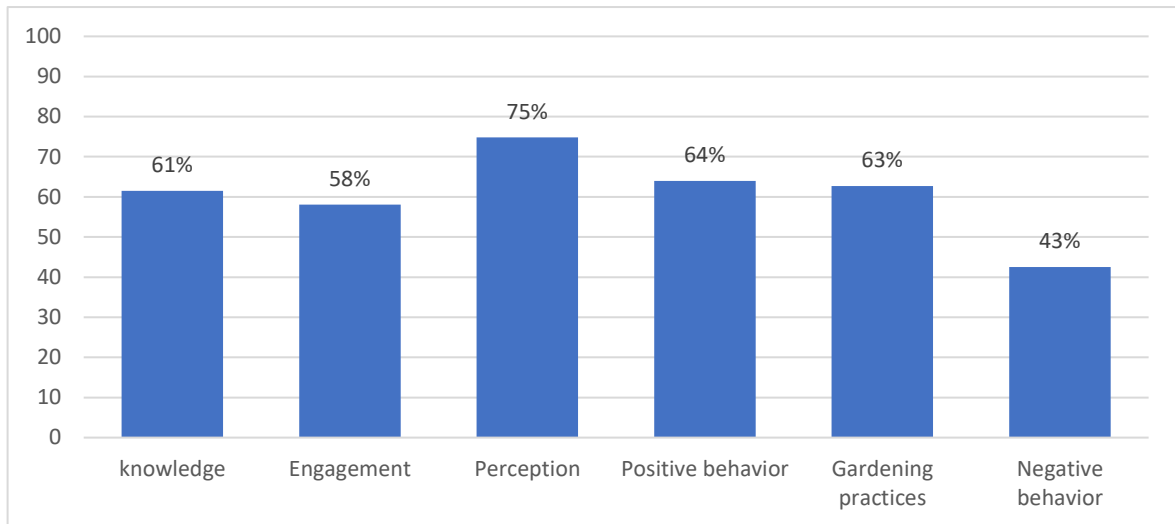


Figure 3.5 Bar Chart Displaying Average Percentage for Knowledge, Engagement, Perception, Behaviors and Practices

Data Analysis

Tests on SPSS were used to compare between the six different dimensions based on different demographics including the chi-square test used to assess the difference between knowledge of native flowers, ability to identify native plants and frequency of visiting nature based on different demographics. ANOVA tests were used to assess differences in the six dimensions such as engagement with nature across different educational levels as well as age ranges, on the other hand, independent sample t-tests examined differences in the six dimensions based on gender and residential place both being of two categories the latter being urban and rural residence. Correlation analysis was used to test for a relationship between different dimensions highlighting the correlation between knowledge and all of the other dimensions.

Appendix 3 provides comprehensive tables with SPSS analysis results.

Chapter Four

Results and Discussion

4.1 Germination Rate and Flowering Success

Germination rate reflects the proportion of viable saffron corms that successfully developed under the different treatment conditions. For saffron, corms are still said to have germinated even with the absence of flowers in the presence of vegetative growth. During the experimental period all the 81 corms germinated; therefore, the germination rate was 100%. *Figure 6* shows a sample of the saffron corms post-treatment with the emerges of leaf shoots which are a sign that dormancy has been broken and germination occurred. On the other hand, flowering success varied among the six treatments. Flowering success indicates the proportion of germinated saffron corms that have successfully produced flowers. Flowering success was the highest with corms stored at 25 °C both large and small, labeled as T6 and T3 (with percentages of 91% and 88% respectively. The least flowering success was seen with corms subjected to cooling pretreatment including T1 with flowering success of only 13 %, many of the corms only produced leaves with no flowers, likewise T4 had a low flowering success, but was greater than T1 due to corm size difference the latter being larger. The observation indicated a negative impact done by low temperatures on the success rate of flowering and overall growth which aligns with research done to assess the effect of

ambient temperature on flower initiation where the key finding was that the optimal temperature of 20°C to 25 °C not only promotes early flower differentiation in saffron but also effectively enhances vegetative growth. Contrary to improper temperatures which lead to inhibited flower initiation and can cause abortion as well as withering of developing flowers. (Wang et al.,2021) For corms stored at 10 °C, T2 (S, 10 °C) was greater than corms of the same size stored at 5°C 13% flowering, but less than ones stored at 25 °C with a percentage of 88% flowering success. Larger corms stored at 10 °C on the other hand, had flowering success percentage in close proximity to the large corms stored at 25 °C. *Figure 9* shows flowering success expressed as a percentage for saffron corms subjected to six unique treatments.

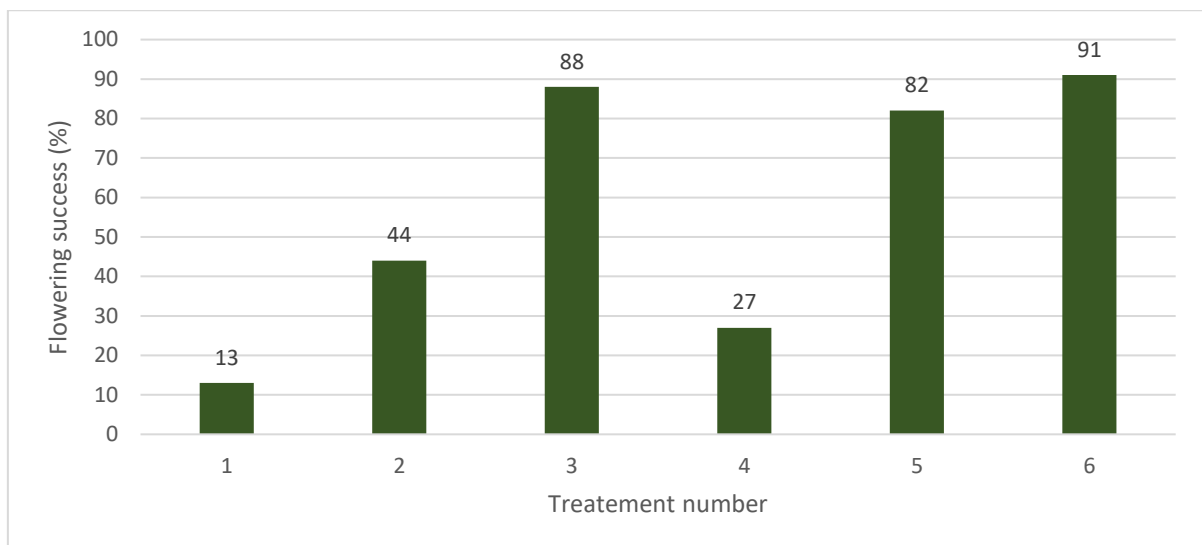


Figure 4.1: Flowering Success Expressed as A Percentage for Saffron Corms Subjected to Six Unique Treatments.

4.2 Leaf Length and Timing as Indicators for Development Rate

The increase of length of saffron leaves as well as the time taken for the leaves to develop reflects the plant’s adaptation to the environment and preparation for the flowering phase. The average length of saffron leaves for each of the six unique treatments was compared after 2 weeks of planting and 3 months. Typically, saffron leaves reach 5-10 cm in the first

2 weeks and 30-40cm over the following months. In the first 2 weeks it was notable that T1 (S, 5 °C) and T4 (L, 5 °C) had delayed growth in terms of leaf length. The large and small corms subjected to cooling pretreatment exhibited short leaves of lengths 3 cm and 4.5 cm on average respectively. Corms subjected to cooling pretreatment had leaves that were notably wrinkled and irregular rather than linear as compared to other treatments. The observation suggested cold-induced stress was affecting the leaves morphology as well as length, both leaf length and corm weight are indicators of vegetative growth as similar negative impact has been documented due to cold storage on the weight and diameter of saffron corms. (Cavusoglu, 2010)

Moreover, T6 (L, 25 °C) has the greatest average length recorded in the two time periods reaching up to 34 cm. Large corms stored at 10 °C did not reflect a delay or irregularity in leaf growth, T5 was in close proximity to T6. Suggesting no impact of storage at 10 °C on leaf length and growth rate, but greater impact with lower temperature cooling pretreatment as seen in the former cases with T1 and T3. *Figure 10* shows a Bar chart comparison of leaf length and emergence timing for corms subjected to six treatments.

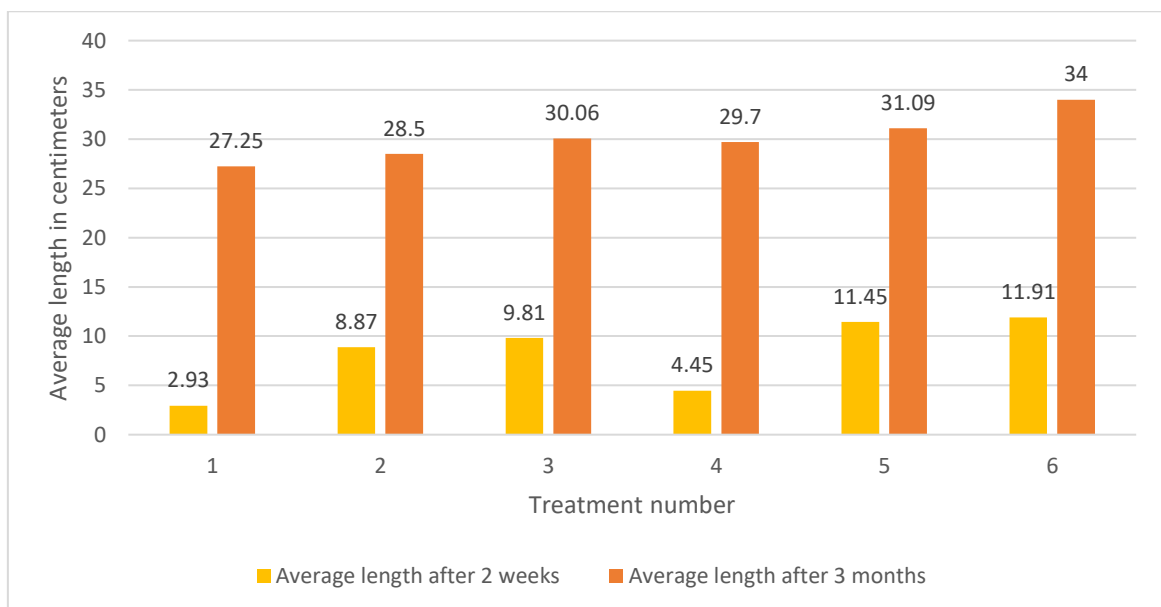


Figure 4.2: Average Length of Saffron Leaves In 2 Weeks Vs 3 Months of The Experimental Period for Each of the Six Unique Treatments.

4.3 Flower Production and Physical Characteristics

The flowers produced were purple with red stigmas. *Figure 11* Shows photographs of saffron in its flowering stage during November. Corms that succeeded in producing flowers had varying numbers of flowers produced; therefore, this criterion works on highlighting the impact of the unique treatments on the number of flowers formed. In the three blocks of randomized treatments, taking in the factor of temperature for large corms the total number of flowers for T4 (L, 5 °C) was 6 flowers as compared to T6 (L, 25 °C) which was 66 flowers which is more than double the amount. Suggesting a direct relationship between temperature and flower production. Additionally, for small corms subjected to precooling treatment labeled as T1 (S, 5 °C) had a total of 3 flowers as compared to T3 (S, 25 °C) which produced a total of 29 flowers, a significantly greater amount. In both case, there was a direct relationship between corm size and the number of flowers produced seen during the experiment. The larger corms produced 4-6 flowers per corm, while smaller corms produced 1-2 flowers per corm on average. The corms stored at 5 °C had few flowers with a great number of corms with no flowers produced along with dwarf and curled leaves observed. For corms stored at 10 °C labeled as T2 (S, 10 °C) the total flowers produced was 19, less than the number of flowers produced at T3 (S, 25 °C) 29 flowers yet greater than T1 (S, 5 °C) 3 flowers. Refer to *Figure 12* for a comparison in terms of flower production per treatment. There was a positive relationship between temperature and flower production, a finding which aligns with a previous study where it was noted that direct low temperature storage extended the flowering season but reduced the flower number as well as stigma yield (Molina et al., 2004) Furthermore, there was a clear relationship observed between corm size and the number of flowers produced as highlighted by comparing only large corms stored at two different temperatures with large corms stored at 25 °C (T6) with 66 flowers produced and large corms stored at 5 °C (T3) with 29 flowers produced a direct indicator that corm

size influences the number of saffron flowers produced the relationship holds true for saffron yield as well. A finding that aligns with a study on corm size and flower production in saffron where it was found that small corms 2-15g produce significantly less flowers, with flowers forming later compared to larger corms and lasting a shorter duration; contrary to large corms (more than 20g), where it was found that these corms produce significantly more flowers than small corms with saffron yield increasing in subsequent years. (Douglas a et al., 2013)

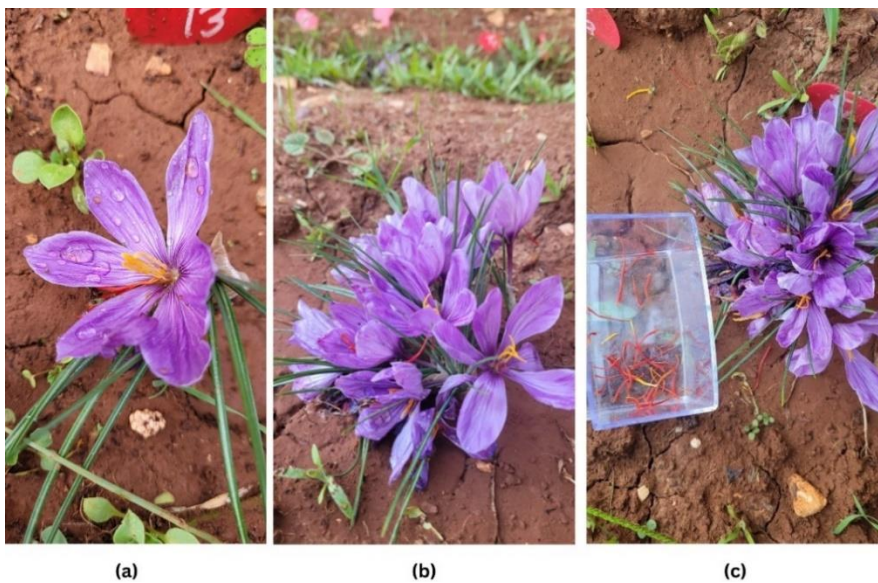


Figure 4.3: Saffron flowers and stigma (a) A close up of a saffron flower showing the three red stigmas which when dried are the saffron threads (b) The appearance of a cluster of flowers produced from a large corm subjected to T6 (L, 25 °C) (c) Collected stigma and flowers taken on November 26th 2023.

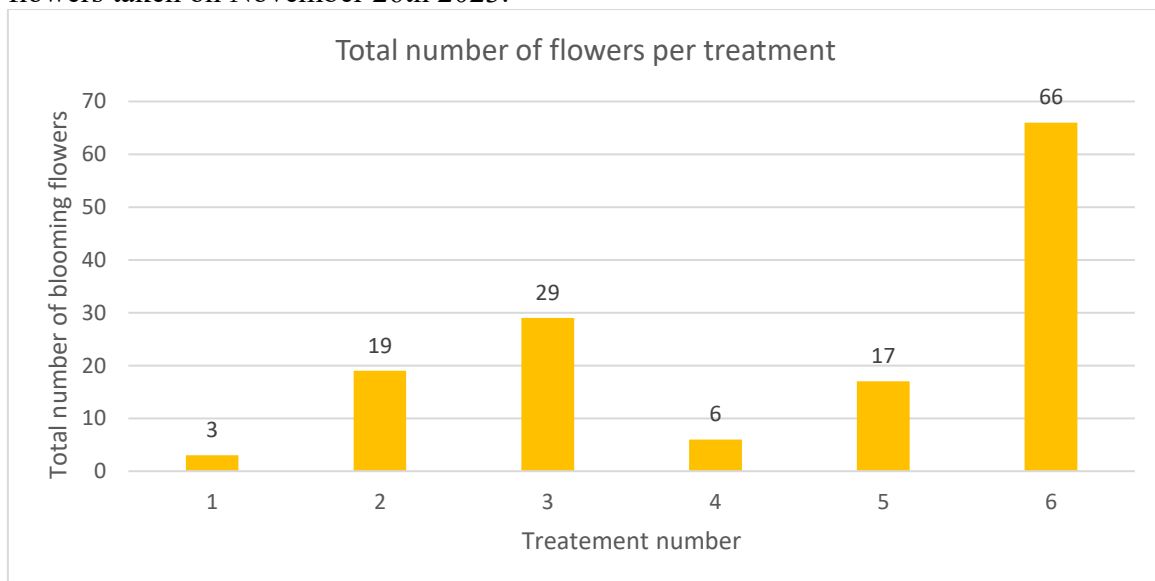


Figure 4.4: Bar Chart Representation Comparing Between the 6 Unique Treatments in Terms of Flower Production.

4.4 Saffron Yield

Each flower produced contained three stigmas which are the saffron threads once dried *Figure 11*. Large and small corms subjected to room temperature of 25 °C labeled T3 (S, 25 °C) and T6 (L, 25 °C) has stigma yield of 87 and 198 respectively. As compared to different sized corms subjected to precooling treatment at 5 °C labeled T1 (S, 5 °C) and T4 (L, 5 °C) which had a stigma yield of 9 and 19 respectively. Considering temperature alone, stigma yield was greater with corms stored at 25 °C, labeled as T6 (L, 25 °C) had 198 stigmas as compared to T4 (L, 5 °C) with a yield of 19 stigmas. While also for smaller corms, T3 (S, 25 °C) 87 stigma yield compared to T1 (S, 5 °C) with yield of 9. Corms subjected to the treatment of 10 °C, T2 (S, 10 °C) had a yield of 57 which is greater than T1 (S, 5 °C) 9 stigmas but less than T3 (S, 25 °C) 87 stigmas. *Figure 13* represents a comparison in terms of stigma yield between the six unique treatments. This decline in saffron yield was also observed in previous research done in order to test whether thermal forcing would increase yield, to which it was found that subjecting corms to cold treatment resulted in reduced saffron yield as well late flowering. (Mzabri et al., 2021)

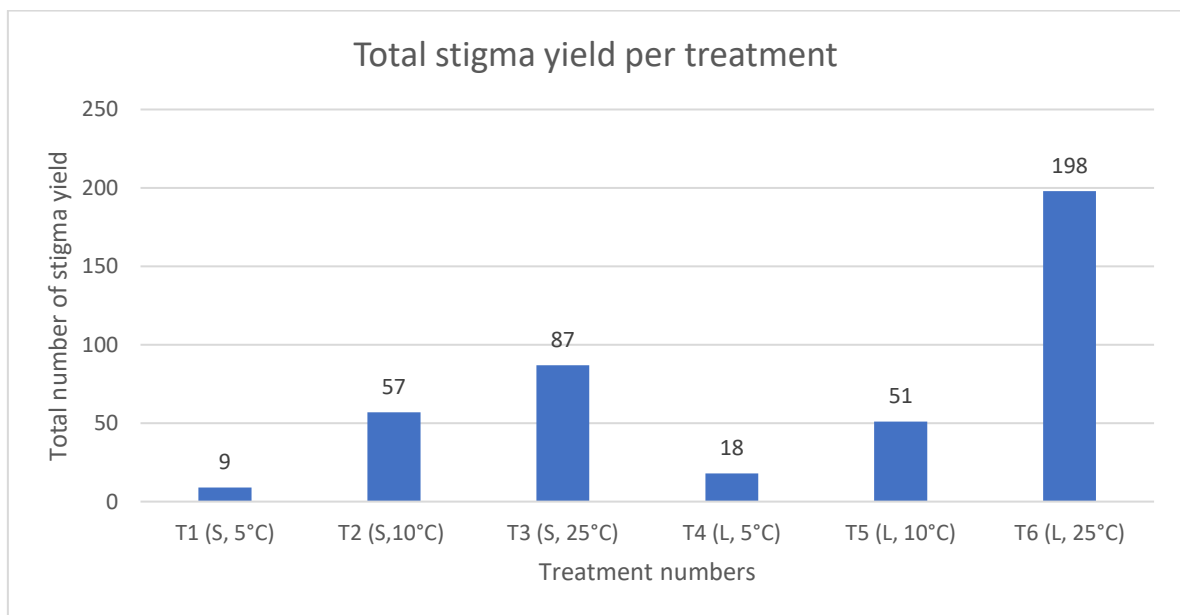


Figure 4.5: Bar Chart Representation Comparing Between the 6 Unique Treatments in Terms of Stigma Yield.

4.3 SPSS Analysis for Survey Data

The knowledge assessment survey carried as part of this research was designed to obtain both descriptive and analytical insights into the current state of knowledge, awareness and practices of individuals in the West bank towards nature. The findings aim to create policy improvements and develop effective conservation strategies and community engagement initiatives guided by actual public understanding.

A structured digital survey was employed to collect data, concentrating on various aspects of biodiversity awareness and attitudes. The survey was analyzed using SPSS software with a sample size of 385 respondents. This analysis included descriptive statistics to summarize key findings and inferential statistics to explore relationships between variables such as knowledge and behavior.

There was no significant difference in knowledge of the national flower analyzed across gender ($p=0.131$), educational level ($p=0.379$), age (0.698) or residence ($p=0.709$). Tables shown in *Appendix 3* The analysis also examined the frequency of visiting natural environments relative to the same demographics. Using a chi-square test There was a significant difference in the frequency of visiting nature based on residence ($p=0.020$). This suggests that individuals' residence such as the presence in rural areas in this case influences how often they engage with nature. Also factors such as proximity to parks could play a role in the variation. Moreover, significant differences were found in the frequency of nature visits based on gender ($p=0.002$), with males visiting nature more frequently than females. This finding is possibility due to influences by societal norms or perceived safety concerns. There was no significant difference observed for the frequency of visiting nature based of age ($p=0.285$), which indicates that facts such as personal preference or lifestyle choices may influence a person's choice of visiting nature across different age groups. Likewise, there was no significant difference found based on residence ($p= 0.121$) which suggests that the

degree of education does not influence an individual's choice of participating in activities or visit the outdoors. *Appendix 3*

The ability to name and identify native plants was assessed against different demographics, the findings highlighted a significant difference in the ability to identify and name native plants across different age groups ($p= 0.001$) with ages of 40-60 being the most capable with the ability to name more than 20 species. There was a significant difference between different educational levels in terms of the ability to name native plants ($p=0.002$), the higher the educational level the greater the ability to identify plants. There was a significant difference found based on residence ($p=0.050$) which can be due to individuals in rural areas are at proximity with nature. There was also a significant difference in native flower identification based on gender ($p=0.013$) with males being more capable of identifying and naming more native plants than females.

People's perception of current conservation efforts and awareness campaigns was also assessed based on different demographics, there was no significance found based on age or gender with 58% of respondents agreeing that efforts are lacking. On the other hand, educational level did have a significant effect on the rating of current conservation efforts ($p= 0.019$), suggesting that individuals with higher educational levels tend to have more critical views on conservation due to greater understanding of environmental issues. This highlights the role of knowledge and information in shaping opinions on conservation success. There was a significant difference in perceiving conservation efforts based on residence ($p=0.008$), with respondents from urban areas agreeing to the lack of conservation and awareness efforts towards nature.

Using SPSS software six new continuous variables were computed from the survey questions titled knowledge, engagement, perception, positive behavior, negative behavior and practices. *Appendix 2* includes the selected questions in each dimension. Through

performing an independent sample t-test it was found that there was no significant difference in biodiversity knowledge based on gender ($p=0.095$). However, a one-way ANOVA revealed a significant difference in biodiversity knowledge across different educational levels ($p=0.003$). Similarly, a significant difference was found based on age ($p=0.014$) and place of residence ($p=0.001$), indicating that both age and residential location influence biodiversity knowledge in a direct way.

There was a significant difference found in engagement with nature based on place of residence ($p=0.003$) using an independent sample t-test indicating higher engagement in rural areas compared to urban areas. There was no significant difference revealed in other demographics including gender, age and educational level.

Analysis of the perception of nature using the independent t-test showed no significant difference based on gender ($p=0.176$) or residence ($p=0.642$). On the contrary, a significant difference was found using one-way ANOVA where age ($p=0.001$) and educational level ($p=0.001$) significantly influence perception of nature in a direct way. Older and more educated people regard nature as highly important.

The study also found no significant difference in positive behavior towards nature based on gender ($p=0.621$), as determined by independent sample t-tests. In contrast, significant differences were observed based on educational level ($p=0.004$) and age ($p=0.003$), as well as residence ($p=0.013$). Higher educational levels, older age groups and rural residence being associated with more positive behaviors towards nature such as picking litter, researching information about biodiversity, and directing other individuals to change their attitude towards nature.

The difference in negative behavior towards nature across various demographics was also analyzed. An independent sample t-test showed a significant difference based on gender ($p=0.001$), with females displaying more negative practices towards nature such as picking

flowers. One-way ANOVA showed no significant difference based on educational level ($p=0.574$), but a significant difference was based on age ($p=0.024$) with ages 25-39 showing the highest frequency of negative practices. Additionally, an independent sample t-test indicated a significant difference based on place of residence ($p=0.042$), with rural areas exhibiting more negative behavior towards nature.

The study looks at gardening practices which are crucial for maintaining biodiversity specially in urban areas, as such an assessment of gardening practices across different demographic factors was done. An independent sample t-test revealed a significant difference in gardening practices based on gender ($p=0.042$) with males being more active. Using One-way ANOVA significant differences were found based on educational level ($p=0.001$), with individuals holding the highest degrees demonstrating more active gardening practices, and based on age ($p=0.002$), with those aged 40-60 being the most active. Additionally, residence influenced gardening practices ($p=0.001$), with rural areas showing greater engagement in gardening activities. *Tables displayed in Appendix 3*

Pearson's correlation revealed no significant relationship between age and engagement with nature ($r=0.20$, $p=0.690$) and between education and engagement with nature ($r=0.008$, $p=0.883$). Correlation analysis also showed a strong positive correlation between knowledge and engagement with nature ($r=0.580$, $p=0.01$). There was also a strong correlation between knowledge and positive behavior ($r=0.571$, $p=0.001$). Additionally, there was a strong correlation between engagement with nature and positive behavior ($r=0.635$, $p=0.001$) suggesting that higher engagement leads to more positive behavior. The results suggest knowledge acquired through educational and awareness programs will lead to increasing engagement as well as promoting positive behaviors to enhance public understanding and support for biodiversity conservation.

Chapter Five

Conclusion and Recommendations

5.1 Conclusion

This study was broken into two assessments with the mutual goal of developing better conservation strategies for Palestinian native plants and sustainable campaigns towards conservation. The practical aspect highlights the impact of temperature and corm size on the growth and yield of saffron, the study revealed that higher temperature 25 °C significantly promote flowering success, leaf development, and saffron yield specially in large corms aligning with previous research, which revealed that ambient temperature between 20°C to 25 °C not only promotes early flower differentiation in saffron but also significantly enhances vegetative growth. While improper temperatures can hinder flower initiation and result in the abortion or withering of developing flowers. (Wang et al.,2021) On the other hand, cooling treatment (5 °C) significantly decreases the flowering success and vegetative growth of saffron. This aligns with documented evidence showing that cold storage can similarly have a negative impact on the weight and diameter of saffron corms which are critical indicators of vegetative growth. (Cavusoglu, 2010) Additionally, corm size influences the number of saffron flowers produced the relationship holds true for saffron yield as well aligning with (Douglas a et al., 2013) where it was found that these corms

produce significantly more flowers than small corms with saffron yield increasing in subsequent years. These results support the use of intermediate temperatures for saffron corm storage promotes its productivity commercially for its varied potential in culinary, medicinal, manufactory and cosmetic potential as well as for research and conservation.

The knowledge assessment survey provides an insight to the current levels of knowledge, awareness and practices towards nature based on different demographics. In the study it was found that knowledge about biodiversity and native plants is impacted by educational levels, age as well as place of residence, with higher education levels and older age as well as residence of rural areas showing greater knowledge and identification skills. Gender does not impact or show a difference in terms of biodiversity knowledge and national flower identification. Results that partially align with a worldwide study which found that biodiversity knowledge and awareness is highest among individuals with high education; nonetheless, urban residence with children had greater biodiversity knowledge, the study took into consideration other factors such as household income and household situation (such as having children or not) as factors that can be further considered in future studies. (Schleer et al., 2022)

Engagement with nature was significantly higher among residence of rural areas compared which can be due to their proximity to nature. Although gender did not significantly affect the engagement, the higher frequency of nature visits was observed among males which could be due to safety concerns and societal norms with males having more freedom of movement. A similar study revealed that males showed more appreciation towards nature than females with no significance found in knowledge. (Fieldings et al., 2023) There was no significant difference found in terms of engagement with nature based on age and educational level, suggesting it is a matter of interest.

The study revealed that individuals aged 40-60, those with higher education, rural residence and males were more capable of identifying native plants in their habitat. Moreover, perception of conservation efforts was more critical among individuals with higher education and urban residents.

Positive behavior such as picking litter and research related to biodiversity was common among older, rural residence and more educated individuals. While negative behaviors including picking native plants and harmful gardening practices like using chemicals was more common among younger age groups (25-39), females and rural residence, a similar study found that respondents of higher education had significantly high score for knowledge, appreciation and engagement with nature. Additionally, in terms of age, individuals of age (45-59) possessed higher level of knowledge and positive behaviors, with groups above 60 showed lower reported behaviors aimed for conservation. (Fieldings et al., 2023) Based on different demographics, it was found that males as well as individuals with higher educational levels, residence of rural areas and those of age 40-60 are more active and involved in gardening activities; however, it is important to note that recent trends observed in the United States indicate a growing interest in gardening among younger demographics such as millennials and generation Z, particularly during the COVID-19 pandemic. (Mayers, 2024) Which reinforces the importance of carrying societal assessment surveys periodically. There was no correlation found between age and engagement with nature, or education and engagement with nature; however, there was a positive correlation between knowledge and engagement, knowledge and positive behavior as well as engagement with nature and positive behavior.

Overall, the demographic analysis revealed that the target group for future effective awareness campaigns should comprise urban residence with higher education, Age groups of 25-39 years old, females additionally, families with children. This can be achieved through

educational content, incorporating of biodiversity in curricula and promoting activities that encourage sustainable practices.

5.2 Recommendations

This study had a limitation in the practical aspect summed by the small sample size of corms; therefore, using a larger sample size will elevate this study; additionally it is recommended to use diverse native geophytes that grow in nature. Adding a storage temperature treatment of 30°C is also recommended as it would add greater support to the impact of moderate to high temperatures on saffron development. Plants native to Palestine that belong the same genus (*Crocus*) and other geophytes are a great subject for future innovative research for their potential uses beyond just the culinary aspect, they can be employed in antidepressants, natural dyes for food or cosmetic products after being conserved from being endangered or rare. Research if implemented on a wide scale can enhance conservation of native plants which would in turn open new market value and be utilized as well as grown by individuals in the community instead of imported invasive plants combating that threat of urban expansion.

As for the knowledge assessment, the limitation was summed in individual's demographics though the data was normally distributed getting equal random samples of respondents through a stratified sample and including more factors that can impact people's attitude and exposure towards nature are considered such as the number of children or financial situation would greatly support future assessments. Carrying knowledge assessment surveys is highly recommended for all conservation efforts or nature related activities, in order to identify gaps for improvement in educational programs and develop sustainable campaigns to advance public knowledge and engagement with biodiversity issues focusing on the key engine for change which is human action. Also, national curriculums should focus on strengthening

knowledge through including biodiversity in lesson and targeting females, urban areas and age groups of 25-39 years old increasing the frequency at which they engage with nature and resulting in future younger generations being more aware of their role in conservation of biodiversity. Finally, these results achieved from demographic- based analysis vary over time meaning societal attitudes are dynamic and cannot be taken as a snapshot but rather longitudinal studies are needed to fully direct campaigns based on understanding.

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Appendices

Appendix 1 Saffron Data

Table 1 Summary of data for the impact of six unique treatments on saffron based on the four criteria for assessment total stigma yield, average length, total number of blooms and flowering success.

Treatment	Number of Replicates	Total Stigma Yield	Average Length of Stem After 2 Weeks	Average Length of Stem After 3 Months	Total Number of Blooms	Flowering Success (%)
T1 (S, 5°C)	16	9	2.93	27.25	3	13
T2 (S, 10°C)	16	57	8.87	28.5	19	44
T3 (S, 25°C)	16	87	9.81	30.06	29	88
T4 (L, 5°C)	11	18	4.45	29.7	6	27
T5 (L, 10°C)	11	51	11.45	31.09	17	82
T6 (L, 25°C)	11	198	11.91	34	66	91

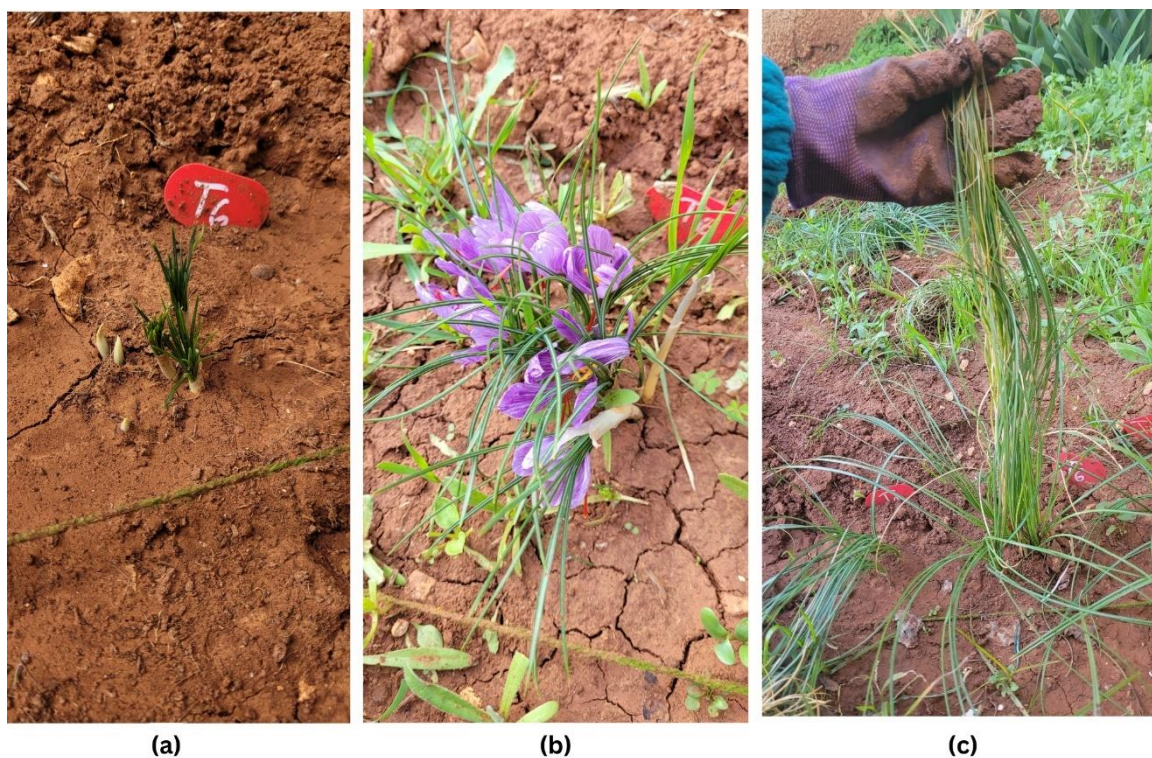


Figure 1: Stages for Development for A Large Corm Stored at 25 °C Represented by T6 (a) Emergence of Saffron Leaves After Two Weeks (B) Development After One Month. (C) Length of Leaves After 3 Months.

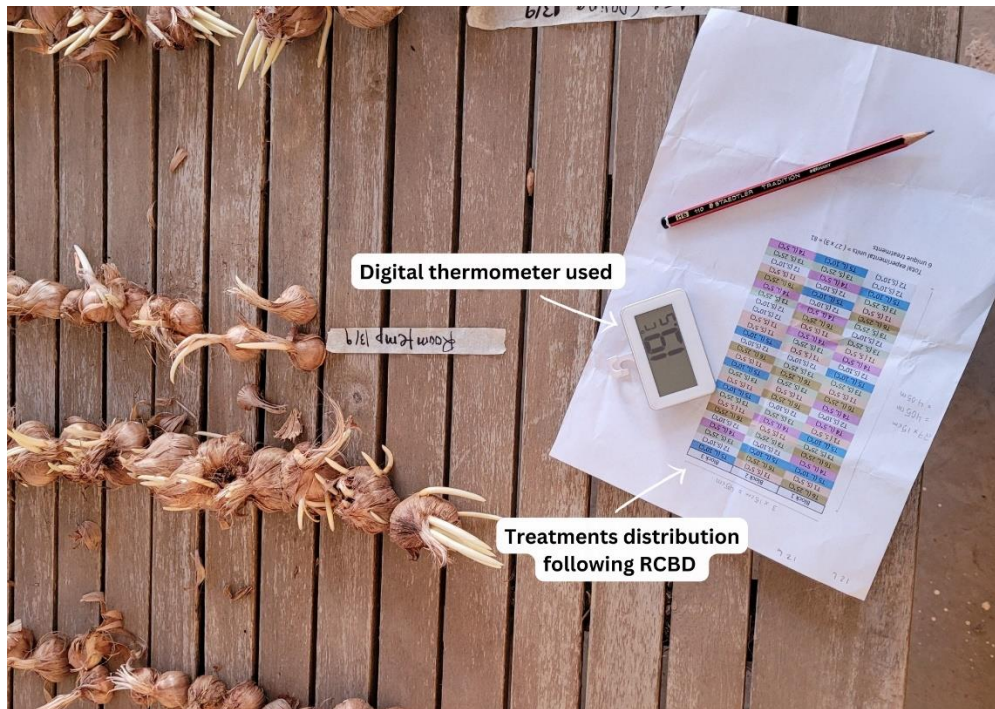


Figure 2: Process of Classification Before Planting Treated Saffron Crocuses in the Field



Figure 3: Field used for Growing Saffron with Labels and Partitions Following RCBD

Appendix 2 Survey Details

Table 1 Questions and Responses Included in the Knowledge Assessment Survey Covering Knowledge Dimension, The Survey Was Presented to Respondents in Arabic As a Google Form

<i>Knowledge</i>	<i>Response</i>
What is your educational degree	<input type="radio"/> Still in school <input type="radio"/> high school degree <input type="radio"/> Bachelor's degree <input type="radio"/> Master's degree <input type="radio"/> Doctorate
Place of residence	<input type="radio"/> Camp <input type="radio"/> Village <input type="radio"/> Town <input type="radio"/> City
Gender identification	<input type="radio"/> Male <input type="radio"/> Female
Frequency of visiting the wilderness	1 2 3 4 5 Never - Always
Each country has its own national flower! According to your knowledge, what is the national flower of Palestine.	<input type="radio"/> Palestinian terebinth <input type="radio"/> Iris Faqoa <input type="radio"/> Poppy flowers <input type="radio"/> The artichoke <input type="radio"/> Wild loofah
Specify your age category	<input type="radio"/> 14-17 <input type="radio"/> 18-24 <input type="radio"/> 25-39 <input type="radio"/> 40-60 <input type="radio"/> More than 60
According to your experience and knowledge, is there a Palestinian effort to raise awareness about biodiversity in Palestine?	1 2 3 4 5 Strongly disagree - Strongly agree
I can name flowering plants found in the wild	<input type="radio"/> I am not able to identify plants <input type="radio"/> 1-5 species <input type="radio"/> 6-10 species <input type="radio"/> 11-20 species <input type="radio"/> More than 20 species
I am aware of invasive species in the Palestinian environment.	1 2 3 4 5 Strongly disagree - strongly agree
I am willing to learn about the classification of wild plants and study them in a specialized training course.	1 2 3 4 5 Strongly disagree - strongly agree

Table 2 Questions and Responses Included in The Knowledge Assessment Survey Covering Awareness Dimension, The Survey Was Presented to Respondents in Arabic as a Google Form.

<i>Awareness</i>	<i>Response</i>
I have noticed a decline in the population and types of wild birds in my area.	1 2 3 4 5 Strongly disagree - strongly agree
I have noticed a decrease in green space in my residential area over the past five years.	1 2 3 4 5 Strongly disagree - strongly agree
The presence of wild plants reflects on the following factors, which one do you think is more important?	<input type="radio"/> Biodiversity <input type="radio"/> Preserving Palestinian identity <input type="radio"/> Soil quality <input type="radio"/> Biological pest control <input type="radio"/> Presence of pollinators such as birds and insects
I go on tours in the wild (as part of environmental or tourist trails)	1 2 3 4 5 Never - Always
Unfortunately, I often notice garbage on environmental trails	1 2 3 4 5 Never - Always
I document wildlife, biodiversity, and nature when I go to nature	1 2 3 4 5 Never - Always
I sometimes pick wildflowers when I go to nature	1 2 3 4 5 Never - Always
Nature and plant biodiversity are essential for food production and improving the quality of clean air, water and medicine.	1 2 3 4 5 Strongly disagree - strongly agree
It is important to me to know that nature and plant/animal biodiversity in Palestine are being taken care of.	1 2 3 4 5 Strongly disagree - strongly agree
I see going to nature as something important for me because of the following	<input type="radio"/> Family commitment <input type="radio"/> Leisure <input type="radio"/> Mental health <input type="radio"/> Enjoy natural scenery <input type="radio"/> Explore nature

Table 3 Questions and Responses Included in the Knowledge Assessment Survey Covering Practices Dimension, the Survey Was Presented to Respondents in Arabic as A Google Form

<i>Practices</i>	<i>Response</i>
During my hikes in the nature, I see it as my duty to remove garbage to protect wildlife.	1 2 3 4 5 <i>Strongly disagree - strongly agree</i>
Sometimes I try to encourage another person to change their activity for a better environment	1 2 3 4 5 <i>Never - Always</i>
In my free time, I always try to find information about an environmental topic or issue to increase my cultural knowledge.	1 2 3 4 5 <i>Never - Always</i>
I avoid plastic bags and use cloth bags when shopping	1 2 3 4 5 <i>Never - Always</i>
I am always ready to participate in supporting local development activities or environmental issues to protect and improve the environment with corporative work such as cleaning sites	1 2 3 4 5 <i>Strongly disagree - strongly agree</i>
I work on developing my home gardening by planting flowers to attract birds and enhance its beauty	1 2 3 4 5 <i>Never - Always</i>
How do you evaluate the presence of wild species in your garden.	1 2 3 4 5 <i>Strongly disagree - strongly agree</i>
I prefer using tillage to remove all wild plants from my land	1 2 3 4 5 <i>Strongly disagree - strongly agree</i>
I sometimes use chemical pesticides to remove wild plants from my land	1 2 3 4 5 <i>Never - Always</i>
I prefer planting imported winter bulbs like hyacinth over wild types like iris flowers and wild garlic.	1 2 3 4 5 <i>Never - Always</i>

Table 6 Computed Variables and their Corresponding Survey Questions Covering Six Dimensions

Computed variable title	Axes covered in survey
Knowledge	<ul style="list-style-type: none"> • Current conservation effort rating • Ability to identify native plants • Invasive species knowledge • Awareness of nature’s importance • Awareness of significance of wildlife • Awareness of the importance of conservation
Engagement	<ul style="list-style-type: none"> • Frequency of nature visits • Willingness to join trainings • Frequency of hiking • Documentation of wildlife
Perception	<ul style="list-style-type: none"> • Recognizing decrease in birds • Recognizing decrease in green space • Recognizing pollution
Positive behavior	<ul style="list-style-type: none"> • Responsibility towards nature • Influence other individuals • Willingness to do research • Following sustainability practices • Willingness to take action
Gardening practices	<ul style="list-style-type: none"> • Practicing gardening • Presence of wildflowers in garden • Applying tillage in gardening
Negative behavior	<ul style="list-style-type: none"> • Picking native flowers • Using chemicals in gardening • Cultivation of imported corms and invasive plants

Appendix 3 SPSS Analysis

Table 1 Reliability Test for Survey Data on SPSS

Reliability Statistics	
Cronbach's Alpha	N of Items
.753	6

Table 2 Test for Normality with Variables Being Normally Distributed with The Reference of Values Between -1 And 1 For Kurtosis And -0.5 And 0.5 For Skewness.

	Descriptive Statistics						
	N	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Knowledge	385	3.0740	.66051	.005	.124	.063	.248
Engagement	385	2.9019	.99312	.051	.124	-.833	.248
Perception	385	3.7429	.87134	-.630	.124	-.075	.248
Positive behavior	385	3.1984	.88888	-.228	.124	-.424	.248
Gardening practices	385	3.1351	1.05722	-.302	.124	-.625	.248
Negative behavior	385	2.1273	.75631	.256	.124	-.575	.248
Valid N (listwise)	385						

Table 3 One-Way ANOVA Knowledge Engagement Perception Positive Behavior Gardening Practice Negative Behavior by Educational Degree

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Knowledge	Between Groups	6.920	4	1.730	4.093	.003
	Within Groups	160.609	380	.423		
	Total	167.529	384			
Engagement	Between Groups	1.080	4	.270	.272	.896
	Within Groups	377.656	380	.994		
	Total	378.736	384			
Perception	Between Groups	27.260	4	6.815	9.799	.000
	Within Groups	264.283	380	.695		
	Total	291.543	384			
Positive behavior	Between Groups	12.205	4	3.051	3.982	.004
	Within Groups	291.194	380	.766		
	Total	303.399	384			
Gardening practices	Between Groups	23.736	4	5.934	5.561	.000
	Within Groups	405.462	380	1.067		
	Total	429.199	384			
Negative behavior	Between Groups	1.668	4	.417	.727	.574
	Within Groups	217.984	380	.574		
	Total	219.653	384			

Table 4 One-Way ANOVA Knowledge Engagement Perception Positive Behavior Gardening Practice Negative Behavior by Age Range

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Knowledge	Between Groups	5.379	4	1.345	3.152	.014
	Within Groups	162.150	380	.427		
	Total	167.529	384			
Engagement	Between Groups	.372	4	.093	.093	.985
	Within Groups	378.364	380	.996		
	Total	378.736	384			
Perception	Between Groups	27.009	4	6.752	9.700	.000
	Within Groups	264.534	380	.696		
	Total	291.543	384			
Positive behavior	Between Groups	12.442	4	3.110	4.062	.003
	Within Groups	290.958	380	.766		
	Total	303.399	384			
Gardening practices	Between Groups	18.511	4	4.628	4.282	.002
	Within Groups	410.688	380	1.081		
	Total	429.199	384			
Negative behavior	Between Groups	6.392	4	1.598	2.847	.024
	Within Groups	213.261	380	.561		
	Total	219.653	384			

Table 5 Independent Samples T-Test Knowledge Engagement Perception Positive Behavior Gardening Practice Negative Behavior by Gender

Independent Samples t-test	t-test for Equality of Means	
	df	Sig. (2-tailed)
Knowledge	383	.095
Engagement	383	.253
Perception	383	.176
Positive behavior	383	.621
Gardening practices	383	.042
Negative behavior	383	.000

Table 6 Independent Samples T-Test Knowledge Engagement Perception Positive Behavior Gardening Practice Negative Behavior by Residence

Independent Samples t-test	t-test for Equality of Means	
	df	Sig. (2-tailed)
Knowledge	381	.000
Engagement	381	.003
Perception	381	.642
Positive behavior	381	.013
Gardening practices	381	.000
Negative behavior	381	.042

Table 7 Difference in Knowledge of National Flower Based on Gender

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7.102 ^a	4	.131
Likelihood Ratio	7.292	4	.121
N of Valid Cases	385		

Table 8 Difference in Knowledge of National Flower Based on Educational Degree

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	17.098 ^a	16	.379
Likelihood Ratio	19.861	16	.227
N of Valid Cases	385		

Table 9 Difference in Knowledge of National Flower Based on Age Range

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	12.651 ^a	16	.698
Likelihood Ratio	13.861	16	.609
N of Valid Cases	385		

Table 10 knowledge in National Flower Based on Residence

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.932 ^a	12	.709
Likelihood Ratio	12.495	12	.407
N of Valid Cases	385		

Table 11 wildflower Count Based on Age Range

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)
Pearson Chi-Square	51.348 ^a	16	.000
Likelihood Ratio	44.468	16	.000
Linear-by-Linear Association	17.922	1	.000
N of Valid Cases	385		

Table 12 wildflower Count Based on Gender

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)
Pearson Chi-Square	12.626 ^a	4	.013
Likelihood Ratio	12.748	4	.013
N of Valid Cases	385		

Table 13 Wildflower Count Based on Educational Degree

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)
Pearson Chi-Square	37.475 ^a	16	.002
Likelihood Ratio	40.089	16	.001
Linear-by-Linear Association	13.459	1	.000
N of Valid Cases	385		

Table 14 Wildflower Count Based on Place Of Residence

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)
Pearson Chi-Square	21.053 ^a	12	.050
Likelihood Ratio	22.195	12	.035
N of Valid Cases	385		

Table 15 Difference in Frequency of Nature Visits Based on Gender

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)
Pearson Chi-Square	17.078 ^a	4	.002
Likelihood Ratio	17.290	4	.002
N of Valid Cases	385		

Table 16 Difference in Frequency of Nature Visits Based on Residence

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)
Pearson Chi-Square	18.156 ^a	8	.020
Likelihood Ratio	17.974	8	.021
N of Valid Cases	385		

Table 17 Difference in Frequency of Nature Visits Based on Gender

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)
Pearson Chi-Square	17.078 ^a	4	.002
Likelihood Ratio	17.290	4	.002
N of Valid Cases	385		

Table 18 Difference in Frequency of Nature Visits Based on Educational Level

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)
Pearson Chi-Square	22.723 ^a	16	.121
Likelihood Ratio	23.961	16	.090
Linear-by-Linear Association	.744	1	.388
N of Valid Cases	385		

Table 19 Difference in Frequency of Nature Visits Based on Age Range

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)
Pearson Chi-Square	18.690 ^a	16	.285
Likelihood Ratio	19.682	16	.235
Linear-by-Linear Association	.506	1	.477
N of Valid Cases	385		

Table 20 conservation effort rating and age range

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)
Pearson Chi-Square	25.316 ^a	16	.064
Likelihood Ratio	27.826	16	.033
Linear-by-Linear Association	.067	1	.795
N of Valid Cases	385		

Table 21 Conservation Effort Rating and Educational Degree

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)
Pearson Chi-Square	29.844 ^a	16	.019
Likelihood Ratio	29.095	16	.023
Linear-by-Linear Association	.762	1	.383
N of Valid Cases	385		

Table 22 Conservation Effort Rating Based on Place of Residence

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)
Pearson Chi-Square	26.775 ^a	12	.008
Likelihood Ratio	25.085	12	.014
N of Valid Cases	385		

Table 23 Conservation Effort Rating Based on Gender

Chi-Square Tests

	Value	df	Asymptotic Significance (2- sided)
Pearson Chi-Square	3.231 ^a	4	.520
Likelihood Ratio	3.250	4	.517
N of Valid Cases	385		

Table 24 Correlation Analysis for The Relationship Between Engagement, Educational Degree and Age Range.

Correlations				
		Engagement	Age range	Edu Degree
Engagement	Pearson Correlation	1	.020	.008
	Sig. (2-tailed)		.690	.883
	N	385	385	385
Age range	Pearson Correlation	.020	1	.648**
	Sig. (2-tailed)	.690		.000
	N	385	385	385
Edu Degree	Pearson Correlation	.008	.648**	1
	Sig. (2-tailed)	.883	.000	
	N	385	385	385

** . Correlation is significant at the 0.01 level (2-tailed).

Table 25 Correlation Analysis for the Relationship Between Knowledge and Three Other Dimensions Which are Knowledge, Perception, Engagement.

Correlations					
		Engagement	Knowledge	Positive behavior	Gardening practices
Engagement	Pearson Correlation	1	.580**	.635**	.463**
	Sig. (2-tailed)		.000	.000	.000
	N	385	385	385	385
Knowledge	Pearson Correlation	.580**	1	.571**	.410**
	Sig. (2-tailed)	.000		.000	.000
	N	385	385	385	385
Positive behavior	Pearson Correlation	.635**	.571**	1	.533**
	Sig. (2-tailed)	.000	.000		.000
	N	385	385	385	385
Gardening practices	Pearson Correlation	.463**	.410**	.533**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	385	385	385	385

** . Correlation is significant at the 0.01 level (2-tailed).

Table 42 Summary of Null Hypothesis Tested on SPSS Separately, Test Used and Final Result Arranged with Respect to the Adjacent Hypothesis.

Null Hypothesis	Test	Result
There is no significant difference in knowledge of the national flower across genders, age, education and place of residence.	chi-square test	No significant difference p=0.131 No significant difference p=0.698 No significant difference p=0.379 No significant difference p=0.709
There is no significant difference in the frequency of going to the wild based on gender, age, education and place of residence	chi-square test	significant difference p=0.002* No significant difference p=0.285 No significant difference p=0.121 significant difference p=0.020*
There is no significant difference in the ability to identify native plants based on gender, age, education and place of residence.	chi-square test	significant difference p=0.013* significant difference p=0.001* significant difference p=0.002* significant difference p=0.050*
There is no significant difference in rating conservation efforts based on gender, age, education and place of residence.	chi-square test	No significant difference p=0.520 No significant difference p=0.064 significant difference p=0.019* significant difference p=0.008*
There is no significant difference between knowledge and awareness in biodiversity based on gender.	Independent sample t-test	No significant difference p=0.095
There is no significant difference between knowledge and awareness in biodiversity based on age.	One-way ANOVA	significant difference p=0.014*
There is no significant difference between knowledge and awareness in biodiversity based on education.	One-way ANOVA	significant difference p=0.003*
There is no significant difference between knowledge and awareness in biodiversity based on residence	Independent sample t-test	significant difference p=0.001*
There is no significant difference between engagement with nature based on gender.	Independent sample t-test	No significant difference p=0.253
There is no significant difference between engagement with nature based on age.	One-way ANOVA	No significant difference p=0.985
There is no significant difference between engagement with nature based on educational level.	One-way ANOVA	No significant difference p=0.896
There is no significant difference between engagement with nature based on residence.	Independent sample t-test	significant difference p=0.003*

Null Hypothesis	Test	Result
There is no significant difference in terms of perception of nature based towards nature based on gender age, education and residence	Independent sample t-test One-way ANOVA One-way ANOVA Independent sample t-test	No significant difference $p=0.176$ significant difference $p=0.001^*$ significant difference $p=0.001^*$ significant difference $p=0.642$
There is no significant difference in terms Positive behavior based towards nature based on gender age, education and residence	Independent sample t-test One-way ANOVA One-way ANOVA Independent sample t-test	No significant difference $p=0.621$ significant difference $p=0.003^*$ significant difference $p=0.004^*$ significant difference $p=0.013^*$
There is no significant difference in terms negative behavior based towards nature based on gender, age, education and residence	Independent sample t-test One-way ANOVA One-way ANOVA Independent sample t-test	significant difference $p=0.001^*$ significant difference $p=0.024^*$ No significant difference $p=0.574$ significant difference $p=0.042^*$
There is no significant difference in terms gardening practices based towards nature based on gender, age, education and residence	Independent sample t-test One-way ANOVA One-way ANOVA Independent sample t-test	significant difference $p=0.042^*$ significant difference $p=0.002^*$ No significant difference $p=0.001^*$ significant difference $p=0.001^*$
There is no significant correlation between age and engagement with nature.	Pearson's correlation	No significant correlation ($r=0.20$, $p=0.690$)
There is no significant relationship between education and engagement with nature. Pearson's correlation	Pearson's correlation	No significant correlation ($r=0.008$, $p=0.883$)
There is no significant relationship between engagement, positive behavior and knowledge.	Pearson's correlation	positive correlation between knowledge in biodiversity as well as engagement ($r=0.580$, $p=0.01$) knowledge and positive behavior, Strong correlation ($r=0.571$, $p=0.001$). engagement with nature and positive behavior, strong correlation ($r=0.635$, $p=0.001$)

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تأثير التخزين البارد على إنبات درنات الزعفران في فلسطين

تقييم المعرفة بالتنوع الحيوي، الوعي والممارسات: دراسة حالة في فلسطين

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الملخص

تتمتع فلسطين بقدر كبير من التنوع الحيوي ، بما فيها مجموعة كبيرة ومتنوعة من الزهور البرية. تهدف هذه الدراسة إلى إيجاد ظروف التخزين الأمثل لدرنات الزعفران ، التي تؤدي إلى نمو وإنتاجية أفضل بهدف تحقيق قيمة اقتصادية وكذلك الحفاظ على النباتات المحلية المختلفة. شمل الجانب العملي لهذه الدراسة تخزين 81 درنة زعفران من حجمين مختلفين في ثلاث درجات حرارة مختلفة

(5 °C, 10 °C, 25 °C) على مدار فترة خمسة أسابيع بعد ذلك زراعتهم في مساحة محددة في حديقة باتباع تصميم القطاعات العشوائية الكاملة (RCBD). تم تقييم أزهار الزعفران بناءً على أربعة معايير تشمل معدل الإنبات ونجاح الإزهار، طول الأوراق، شكل وإنتاج الأزهار بالإضافة إلى محصول الزعفران. وقد لوحظ النمو الأكثر أهمية من ناحية إنتاج الزهور وإنتاجية الزعفران في درنات الزعفران المخزنة عند درجة حرارة 25 °C تليها 10 °C وأخيراً 5 °C. على عكس الإنتاجية في الزعفران المخزن على درجة حرارة 5 °C حيث أنتجت أوراق قصيرة ومجعدة بالإضافة إلى عدد قليل من الزهور؛ وبالتالي، عدد ميا سم قليلة أو معدومة. قامت الدراسة بإبراز العلاقة الإيجابية بين درجات الحرارة المعتدلة وزراعة الزعفران، في مقابل التأثير السلبي للمعالجة بالتبريد على نمو وتطور وإنتاجية الزعفران على عكس نباتات الأبصال الأخرى التي تحتاج إلى

التبريد لك سر حالة ال سكون. بالإضافة إلى ذلك، أنتجت الدرنات الكبيرة كمية أكبر من الزعفران مقارنة بالدرنات الأصغر عند تخزينها في نفس ظروف درجة الحرارة و نفس الفترة الزمنية، وهي نتائج تتوافق مع الدراسات السابقة وتسلط الضوء على إمكانية الاستفادة من الظروف المثلى لزراعة المزيد من النباتات المحلية وكذلك الزعفران في المنطقة الوسطى في الضفة الغربية.

في الجزء الثاني من هذه الدراسة، تم إجراء مسح لتقييم المعرفة المتعلقة بالتنوع الحيوي في الضفة الغربية بهدف فهم المعرفة العامة والوعي والممارسات تجاه الطبيعة. تم تحليل البيانات التي جمعت على مدار ثلاثة أشهر من 385 مشاركاً من خلال مسح منظم و تحليل على برنامج SPSS . يؤكد هذا الجزء من الدراسة على الحاجة إلى استراتيجيات حماية جيدة للتنظيم وهدافة تعتمد على معلومات ديموغرافية محددة لتعزيز واستدامة مشاركة المجتمع والسياسات الفعالة. أظهرت الدراسة أن هنالك علاقة بين المعرفة، الوعي والسلوك التي تتأثر بالعوامل الديموغرافية مثل الجنس، العمر، التعليم ومكان الإقامة.

أظهرت الدراسة أن هناك ارتباط إيجابي بين المعرفة في التنوع الحيوي وكذلك التفاعل مع الطبيعة ($p=0.01$ ، $r=0.580$) أيضا المعرفة والسلوك الإيجابي ($p=0.001$ ، $r=0.571$) بالإضافة الى التفاعل مع الطبيعة والسلوك الإيجابي ($p=0.001$ ، $r=0.635$). مما يسلط الضوء على الحاجة إلى برامج تعليمية تثري المعرفة في مجال التنوع الحيوي للأفراد من خلال معرفة الفروق الديموغرافية و تأثيرها من أجل تعزيز المشاركة المستدامة الواعية لمستقبل البيئة.