Journal of University of Duhok., Vol. 20, No.1 (Agri. and Vet. Sciences), Pp 50-63, 2017
DOI: https://doi.org/10.26682/avuod.2017.20.1.8

SEED GERMINATION ECOLOGY AND SEEDLING EMERGENCE OF SIXTEEN TREE SPECIES AUTUMN SOWN

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(Received:August 6, 2017; Accepted for publication: November 13, 2017)

ABSTRACT

In nature, the regeneration and the seed germination ecology of tree species is varied due to divers' environmental factors and evolution process. As a consequence, understanding the factors controlling the seed germination and seedling emergence in the time and the space. In most nurseries, tree seeds are usually sown in spring or rarely in autumn and, they are often pretreated to increase the seed germination where the germination timing is selective sieve that a plant experiences throughout its life history. However, in most nursery of Kurdistan region, the managers have not a good knowledge about the seeds sowing timing and seedling emergency of native tree species. Therefore, the main aim of this study is to investigate seed germination phenology with providing new data and determine optimal ways of seed sowing time that will permit a best seedling establishment of sixteen native and introduced tree species. The results showed, the seed sowing timing and seedling emergence of these tree species. In addition, these species exhibit significant divergence in term sowing timing and seedling establishment. Thereby, our results have a high value for managers of Kurdistan governmental and private nurseries as a suggestion which exact time is better for sowing seeds and which seeds need pre-treatment before sowing in order to obtain better regeneration.

KEYWORDS: *Sowing timing, Seedling emergency, Germination timing, Regeneration,*

1. INTRODUCTION

In the life cycle of a plant species, germination processes is a more crucial phase which greatly affecting its population dynamic, regeneration and fitness as well as its persistence (Fenner &Thompson 2005). Germination as part of plant's life history strategy, it is an irreversible biological process:Once germination has started the embryo is committed irrevocably to growth or death (Baskin & Baskin 2014). Generally, in order for the seeds of a species to germinate, they must be in suitable environmental conditions "germination niche" which usually favour the growth and establishment of the seedlings (Harper 1977). Consequently, a good understanding of the ecological factors controlling the germination in time and space is crucial for optimal biodiversity conservation and future management (Galme´s *et al*. 2006; Mattana *et al*. 2010; Abdoallahi *et al*. 2012). Furthermore, in case of endangered species, a major priority in efforts to conserve these species is to maintain their evolutionary potential and thus their persistence by understanding and improving their germination (Fenner & Thompson 2005; Leck*et al*. 2008).To achieve this aim, information must be obtained concerning the seed germination ecology and seedling recruitment in the life cycle of target species (Baskin and Baskin 2000; Leck *et al*. 2008, Imbert *et al*. 2012).

In literature, a range of seed ecology attributes such as seed production, seed mass, germination percentage, seed longevity seed viability, seedling growth and the presence of a soil seed bank have well be studied in both the laboratory and the Field (see e.g. Baskin & Baskin 2014; Fenner&

DOI: https://doi.org/10.26682/avuod.2017.20.1.8

Thompson 2005; Youssef *et al*. 2011). However, our understanding of both seed sowing timing and seedling emergence timing remain incomplete and in need of additional scientific investigations (McMillan-Browse, 1978; McDonald, 1986; Dirr and Heuser, 1987; Young and Young, 1992, Takos & Efthimiou 2003; Donohue 2005). In most nurseries around the world, tree seeds are usually sown in spring or rarely in autumn followed by the weather conditions and/or control conditions "green house" that increase significantly the seed germination (Takos & Efthimiou 2003). In this circumstance, managers often use pre-treatments in order to breakdown physical and/or physiological seed dormancy by e.g. mechanical scarification, cold stratification, chemical scarification (Baskin & Baskin 2014). In term of seed dormancy, management practice and germination required temperature. Forest tree seeds can be sown in three different seasons (autumn, springs and summer) seeds sown. Mild and cold winter predominate the management practice (Hartmann *et al*, 1997).

Germination timing is selective sieve "evolution process" where the season of germination determined by the seasonal environment that a plant experiences throughout its life history i.e. autumn, winter, spring summer germination phenology (Topham *et al*, 2017).

Seeds of tree species whose viability decreases rapidly should be sown immediately (e.g, *Ulmus*). While, the large seeds are often prefered outdoors autumn season sowing such as *Castanea spp., Aesculus spp., Quercus spp., Corylus spp.*, if these seeds are not stored properly in winter the quality of seeds reduce after harvesting (Dirr and Heuser, 1987; Takos and Merou, 1995; Hartmann *et al.*, 1997; Takos *et al*., 2002). Seeds that have dormancy in embryo, autumn sowing is usually used for these seeds e.g, *Taxus spp, Malus spp., Prunus spp., Pyrus spp*. (Hartmann *et al.*, 1997), because low temperature of winter cannot break the embryo dormancy of seeds. As well as autumn sowing is using for the species that have embryo dormancy with hard coat for example *Crataegus spp*. *Berberis spp., Cotinus spp., Cornus spp.*(Lawyer, 1978), some other seeds whose sown early (Dirr and Heuser, 1987). However, the disadvantages of autumn seeds sowing. High temperature of autumn lead seeds to germinate which insecure the seeds to low temperature in winter which may damage seed embryo (Hartmann *et al*, 1997). In addition, the late spring frost may damage the seed due to premature germination in spring. Seeds with wings and large seeds may endanger by Rodents (Hartmann *et al*, 1997).

The aim of this study is to investigate both seeds sowing timing and seedling emergency timing germination of some Kurdistan region forest tree species. Without pre-treatment and after fall sowing and to permit spring sowing some seed may require some pre-treatment to remove dormancy. Therefore, the present study focus on two essential objectives in particular: (i) Provide new data in terms of seed germination phenology and thus identify the major differences in seed germination timing that might contribute tomanagement practices for local nurseries (ii) Determine optimal ways of seed sowing time that will permit a best seedling establishment. The species which were studied have not been examined after sowing under the weather conditions of autumn in Duhok province, Kurdistan region of Iraq. This study will help to show governmental and private nurseries the exact time for some tree seeds to be seeded and what type of seeds need pre-treatment before sowing as well as some other agricultural sectors that deal with seeds dormancy.

MATERIAL AND METHODS

1.1. Site Study:

Field experiment was carried out on 01 October 2016 in Malta nursery, Duhok province, Kurdistan region of Iraq (42 56'05.68 E, 36 51'27.96' N) (Fig. 1) which located between Mediterranean and Irano-Anatolian region (Youssef *et al*, 2015). It is the main forest nursery which provides directory of agriculture and directory of forest and rangelands with tree seedlings as well as providing Duhok city with seedling for urban forestry and Green belts. It is a governmental nursery established to supply all public and private sectors with tree seedlings in order to increase the urban green areas which in turn will play a remarkable role in temperature diminishing, protecting soil from erosion and water run-off cases, increase the aesthetic value and quality of places, promote recreation and reduce pollution (see Nowak *et al*. 2013; Tasoulas *et al*, 2013).

According to bioclimatic data from Malta nursery - Duhok, the city is belongs to the Mesopotamian region and having some Mediterranean climate features (Youssef *et al.*

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2015). As well as according to the classification of Köppen-Geiger climate system (Peel *et al*. 2007) it classified as a semi-arid region. Weather conditions (Rainfall, temperature) as well as starting precipitation season and ending season in the nursery were the mean annual temperature for 2016 – 2017 was 26.7 **°C**, the average annual precipitation in Malta nursery was (386mm), while the precipitation started on 28 October 2016 and ended on May 20 of 2017.

Fig. (1): Location of Malta Nursery in Duhok Governorate – Kurdistan region

1.2. Tree species study:

In this study, sixteen tree species were used in field experiment (see Table 1) for more details about the species, collected date and location and storage condition). These trees species are more used in nursery of Kurdistan Region in general and in Malta nursery in particular. First, fully matured seeds of each tree species were collected from plants with a vigorous and healthy appearance growing in field. Seed collection was carried out on summer 2015; and seed collected was cleaned, and then dried progressively up for 20–30 days at room temperature, and then preserved in air tight vase at before germination studies were initiated.

A 100-seed lot issued from each tree species were selected and then they distributed into four 25-seed replicates. They were seeded in black pots (1 liter) containing sandy soil in normal blocks each pot with sand and 25 seed per pot. (Krussmann, 1981) study method was used for the depth of planted seeds, which highlighted that the planted seed in the soil equal three times of seed size. After dispersing the seeds in the black pots a thick layer of sand were covered the seeds about 2 – 3mm, this cover will resist seed to rain, hail and sun in the winter (Krussmann, 1981). Irrigation was started at the beginning of March until germination completion. Seedling measurements were taken place weekly at the beginning of seed germination until completion of emergence which was from December until June of 2016.

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Table (1) : Tree species, abbreviation, collection date and location of mother plant, seed storage conditions until seed sowing.

Number	Tree species	abbreviation	Collection date	Location of Mother Plant	Seed storage conditions
1	*Melia azedarach*	Melazd	2015	Malta Nursery, Duhok	Air tight vase at room temperature
2	*Parkinsonia aculeata*	Paracu	2015	Hawler city	Air tight vase at room temperature
3	*Ceratonia siliqua*	Cersil	2015	Mazi Garden, Duhok	Air tight vase at room temperature
4	*Pistacia eurycarpa*	Piseur	2015	Mateen Mountain, Deralok	Air tight vase at room temperature
5	*Pyrus syriaca*	Pyrsyr	2015	Mateen Mountain, Deralok	Air tight vase at room temperature
6	*Pistacia khinjuk*	Piskhi	2015	Mateen Mountain, Deralok	Air tight vase at room temperature
7	*Celtis australis*	Celaus	2015	Gara Mountain	Air tight vase at room temperature
8	*Lauru s nobilis*	Launob	2015	Mazi garden, Duhok	Air tight vase at room temperature
9	*Paliurus spina-christi*	Palspi	2015	Zawita District, Duhok	Air tight vase at room temperature
10	*Pinus brutia*	Pinbru	2015	Malta nursery, Duhok	Air tight vase at room temperature
11	*Robinia pseudoacacia*	Robpse	2015	Malta nursery, Duhok	Air tight vase at room temperature
12	*Sorbus umbellata*	Sorumb	2015	Gara Mountain, Duhok	Air tight vase at room temperature
13	*Cercis siliquastrum*	Cersis	2015	Malta nursery, Duhok	Air tight vase at room temperature
14	*Rhus coriaria*	Rhucor	2015	Mateen Mountain	Air tight vase at room temperature
15	*Juniperus oxycedrus*	Junoxy	2015	Malta nursery, Duhok	Air tight vase at room temperature
16	*Crataegus azarolus*	Craaza	2015	Mateen Mountain	Air tight vase at room temperature

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2. RESULTS AND DISCUSSION

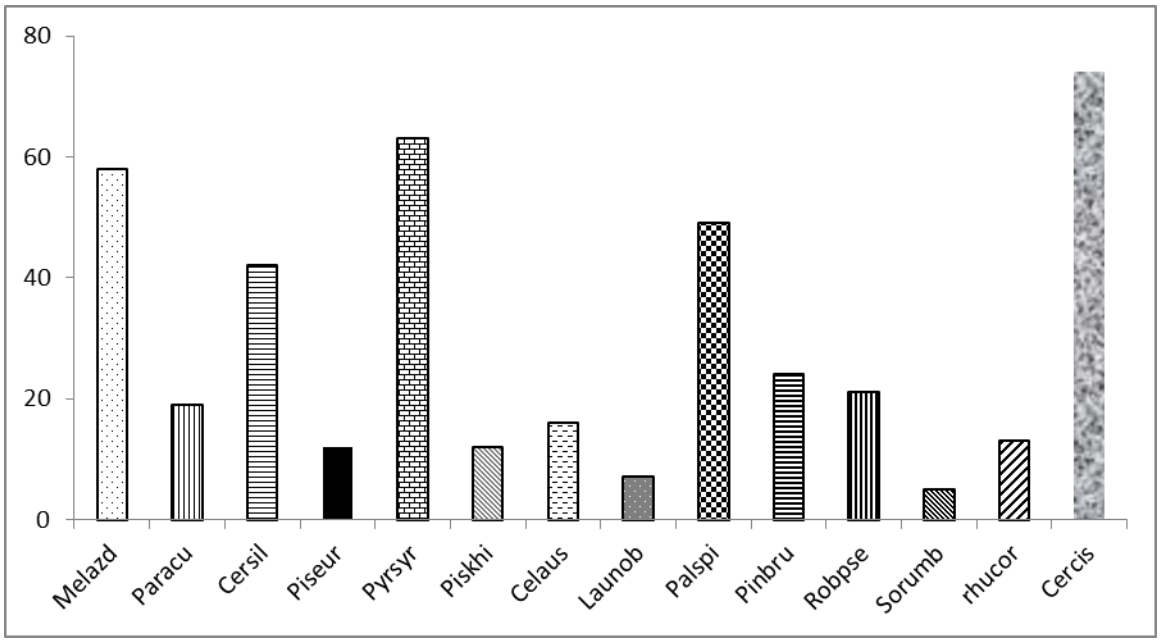

Fig. (2) : Forest tree species and seed germination rate

2.1. Seed Germination of Tree species

Melia azedarach

The seed germination percentage of the species *Melia azedarach* (Figure 2) was about 58%. This shows that the germination rate of species is good and it does not need for pre-treatment as the study result of (Salim Azad, *et al*, 2010) of *Melia azedarach* seed germination was 53.3%.

Parkinsonia aculeata

The study result shows (Figure 2) that germination rate of *Parkinsonia aculeate* was approximately 19%. This rate of germination is not good but as well as it is not a slight rate comparing to the result of (Vora, 1989) study which was 8% seed germination, this may because the environmental conditions were more suitable that the area where the study of (Vora, 1989).

Ceratonia siliqua

Seed germination of *Ceratoniasiliqua* was 42% (Figure 2). The rate of germination was good comparing to the study of (Gunes, *et al*, 2013) similar findings was gained from this study which was (13.57%) out of 27 seeds.

Pistacia eurycarpa

Findings shows germination rate of *Pistacia eurocarpa* was 12% (Figure 2). The result of germination may be it is slight but comparing to a kilogram of seed is good without pre-treatment. While, the study of (Mahdi *et al*, 2016 Inedit) showed that the perfect pre-treatment is 10 minutes soaking in H2SO4 and the result was 42% out of 100 seeds. As well as, paper of (Ellis *et al*, 1985) recommended the same pre-treatment.

Pyrus syriaca

In regard to germination rate of *Pyrus syriaca* was (68%) (Figure 2). The rate of germination was very good in compare with the result of the study of (Al-Bukhari, 2002) which was 40%, this may be because *Pyrus syriaca*is native to Kurdistan region of Iraq and it is more adapted to the environmental condition in the native area.

Pistacia khinjuk

Findings shows germination rate of *Pistacia khinjuk* was 12% (Figure 2). The result of germination may be it is slight but comparing to a kilogram of seed is good without pre-treatment. While (Mahdi *et al*,2016 Inedit) showed that the perfect pre-treatment is 10 minutes soaking in H2SO4 and the result was 35% out of 100 seeds.

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As well as, paper of (Ellis *et al.,* 1985) recommended the same pre-treatment.

Celtis australis

The findings showed that seed germination of this species was (16%) (Figure 2).This finding is good but for better results need pre-treatment which supported by some other studies (Ellis *et al.,* 1985; Hartmann*et al.,* 1997, Takos and Efthimiou. 2003).

Laurus nobilis

The findings showed that seed germination of this species was (16%) (Figure 2).This finding is good but for better results need pre-treatment which supported by some other studies (Young and Young, 1992; Takos and Merou, 1995; Hartmann *et al,* 1997). (Takos, 2001) reported that cold season may destroy the seeds (*Laurus nobilis*). Hence, cold season sowing must be avoided *Paliurus spina-christi*

Seed germination of *Paliurus spina-christi* was (49%) (Figure 2).This shows that the germination rate of species is good and it does not need for pre-treatment and the research results disagreed with the result of the study of (Pipinis, Milios, and Smiris, 2011) conducted in Greece,where it is noticed that the germination of controlled seeds was low (4.17%). This might be because the environmental conditions were more suitable in Malta Nursery than the area in Greece.

Pinus brutia

The seed germination percentage of the species *Pinus brutia* was 24% (Figure 2). This is one of Kurdistan region native tree and the result showed that seed germination rate of *pinus bruita* was good which is similar to the findings of the research of (Skordilis and Thanos 1995) whom reported that the seed germination of *Pinus brutia* was about nearly (20%) that has been conducted inGreece.

Robinia pseudoacacia

Seed germination percentage of *Robinia pseudoacacia* (Figure 2) was (21%). This showed that rate of germination is not good but however, it is not a slight rate but in comparison with the paper of (Masaka and Yamada 2009) it has approximately the same result 22% of seed germination.

Sorbus umbellata

Seed germination percentage of *Sorbus umbellate* (Figure 2) was (5%). This showed that rate of germination is not good and it require pre-treatment and this was similar to the findings of (Gultekin, *et al*. 2007) who reported that the weight of 1000 *Sorbus umbellata* seeds only 23.3g were germinated and the best pre-treatment was stratification for 45 to 75days.

Cercis siliquastrum

Seed germination percentage of *Cercis siliquastrum* (Figure 2) was (74%). The result showed that this species does not need any pre-treatment because the rate of germinated seeds was good, comparing to the study of (Takos and EFthimion 2003) which was very poorly germinated (21%) .

Rhus coriaria

The result showed that seed germination rate was (13%) (Figure 2). The outcome that obtained from this research was better than the result of study of (Takos and Efthimion 2003) which was about (0%); this is due to the double dormancy that the *Rhus coriaria* has it. It requires pre-treatment to break dormancy (Young and Young, 1992).

Juniperus oxycedrus and *Crataegus azarolus*

There was no germinated seed recorded for these two species *Juniperus oxycedrus* and *Crataegus azarolus* (Figure 2). The result of this study showed that this two species require pre-treatment because it has two types of dormancy or double dormancy (Takos and Efthimion 2003) physical (hard coat) and physiological (embryo dormancy). The study of (Ma'an development center 2017) highlighted the best pre-treatment for these two species is scarification for 3 months.

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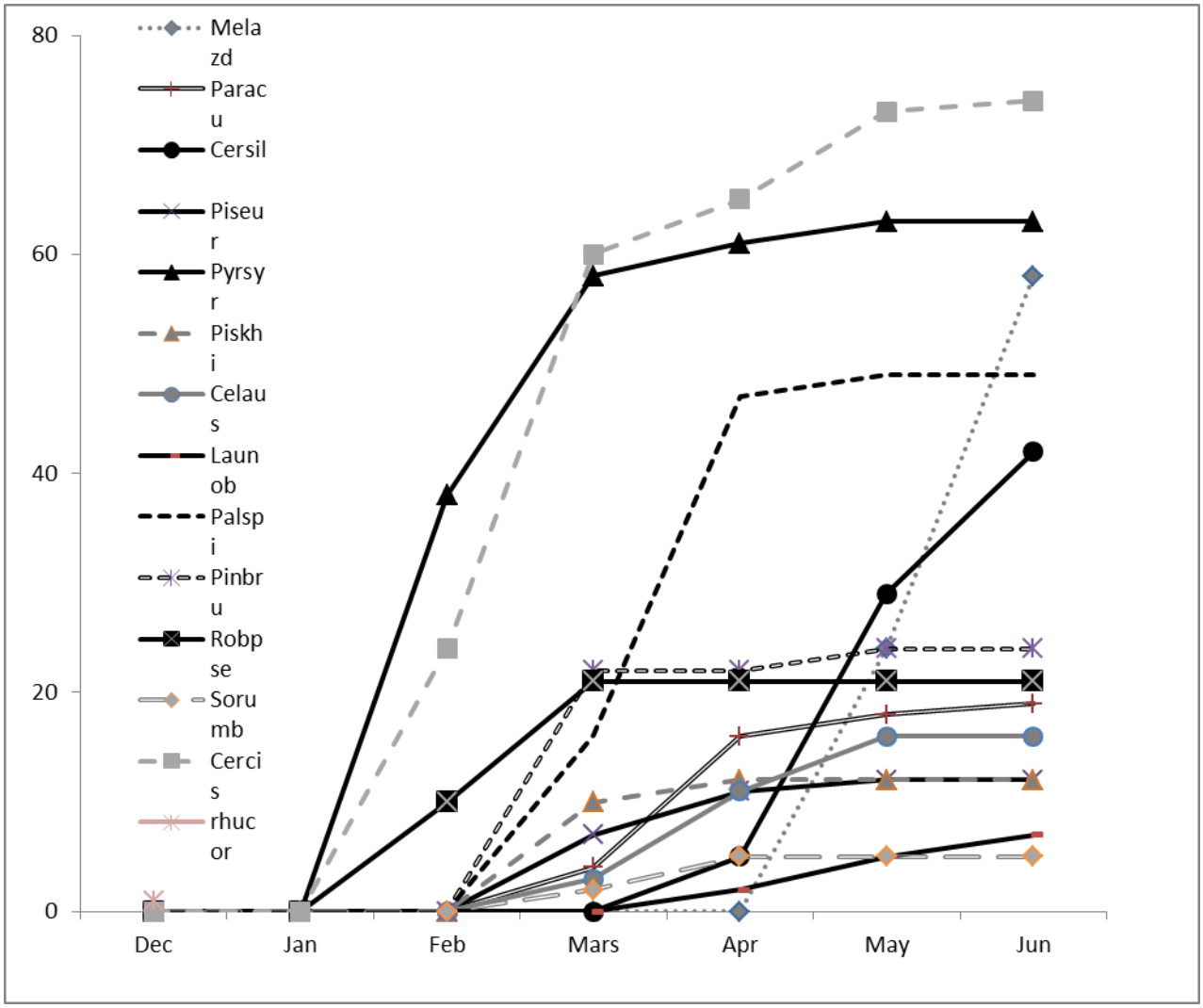

Fig. (3) : Suitable sowing time

2.2. Suitable sowing timing of tree species
2.3.

Group1: Late winter seedling emergence (*Pyrus syriaca, Robinia pseudoacacia, Cercis siliquastrum*)

The best time for seeds sowing of this group of tree species should be on the winter period. Actually, the seeds of the tree species belonging to this group 1 began to germinate on the January (see figure. 3) and it achieve the optimal germination rate on March and April. According to (flora of Iraq) *Pyrus syriaca* and *Cercis siliquastrum* both are native to Kurdistan region of Iraq and both adapted to the environmental conditions of the area and got optimal germination before drying season. For better germination sulphuric acid scarification is the best pre-treatment (Piotto and Di Noi 2003).

Group 2: Early spring seedling emergence (*Pinus brutia, Paliurus spina-christi, Pistacia Khinjuk, Parkinsonia aculeate, Pistacia eurycarpa, Celtis australis, Sorbus umbellata, Rhus coriaria*)

The study results showed that this group of tree species sowing time should be on late winter-early spring. Actually, the germination of seeds of these tree species group started from February and it obtained the optimal germination on March to April (see figure. 3). Almost all this group tree species belong to Irano-anatolian and Mediterranean region (Piotto and Di Noi, 2003). So, it needs humidity and wait until the cold season finish until February and rain season continue until April. There is some species require pre-treatment before sowing such us *Pistacia spp* 10 minutes soaking in H2SO4 and *Sorbusumbellata*best pre-treatment was

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stratification for 45 to 75 days (Gultekin *et al.* 2007). (Young and Young, 1992) has recommended scarification for *Rhus coriaria.* Eight days stratification recommended by (Piotto and Di Noi 2003).*Pinus spp*. best sowing time start on March (figure 2). For *Pinus brutia* as well as, clay + ash as growing media has the best significant effect on growth of *Pinus spp* (Salih T., W. 2016).

Group 3: Spring seedling emergence (*Ceratonia siliqua, Laurus nobilis*)

This group of tree species sowing should initiate on early spring. Actually, the seeds of these tree species germinate in spring (March) and it achieve the optimal germination on May and June (see figure 3). Seed germination of *Ceratonia siliqua* was good (see figure. 1). It belongs to Fabaceae family and has a hard coat and need one month to be in humidity to break that hard coat. For better germination Mechanical scarification was recommended by (Piotto and Di Noi 2003).

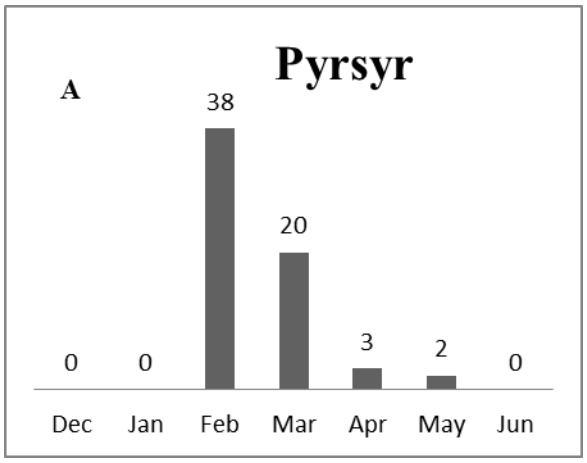
Group 4: Early summer seedling emergence (*Melia azedarach*)

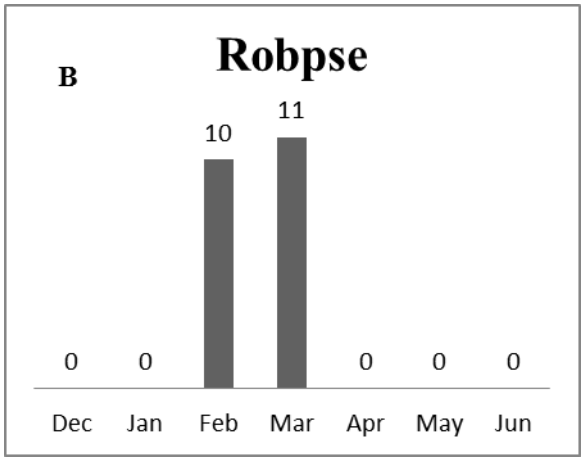
This tree species sowing time should be in late spring. Its seeds start the germination process from April and it obtained the optimal germination on May to June (see figure. 3). Thus, according to this research the nurseries should initiate sowing species seeds on April, due to high level of humidity and the seeds are large, the study show that seeding in January, February and March may cause rodent to the seeds of *Melia spp*. (Hartmann *etal.*, 1997) highlighted that the fall sown may cause rodent large seeds. This species is belonging to tropical species and it is not native to Kurdistan region of Iraq, so it needs irrigation at the first step of seeding these seeds on April.

Group 5: Seeds needs pretreatment (*Juniperus oxycedrus* and *Crataegus azarolus*)

It cannot recommend any sowing time for this two species because there was no germinated seed recorded for this group of tree species. The result of this study showed that these group of tree species need pre-treatment due to their double "physical-physiological" dormancy. Collecting seeds from the area that have animal strobili (Wild boar, foxes, etc) as well as, 30-90 dayscold stratification of seed nakedly recommended by (Piotto and Di Noi 2003) and (Ortiz P., L. 1998). The best pre-treatment for *Crataegus azarolus* suggested by (Ma'an development center, 2017) which is seeds fermentation for few days in its pulp**.**

2.3 Seedling emergence





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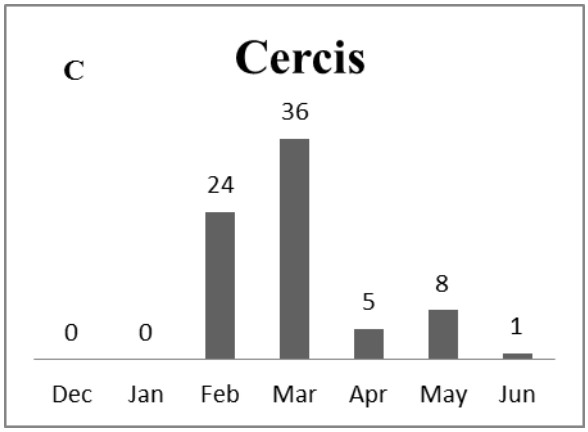

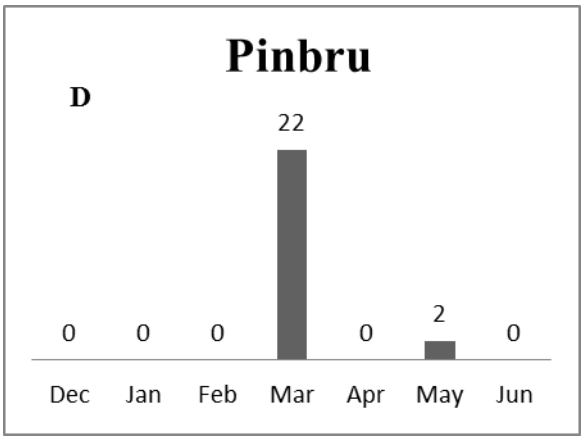

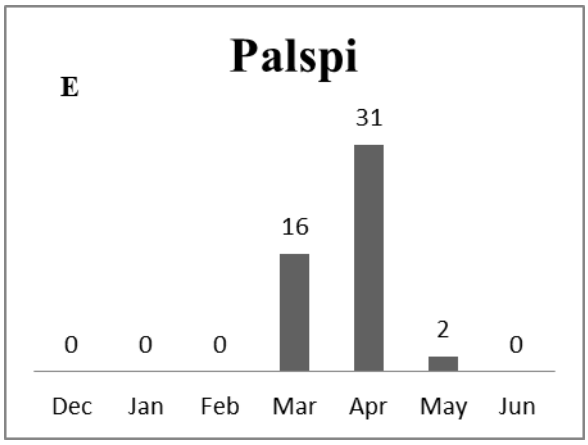

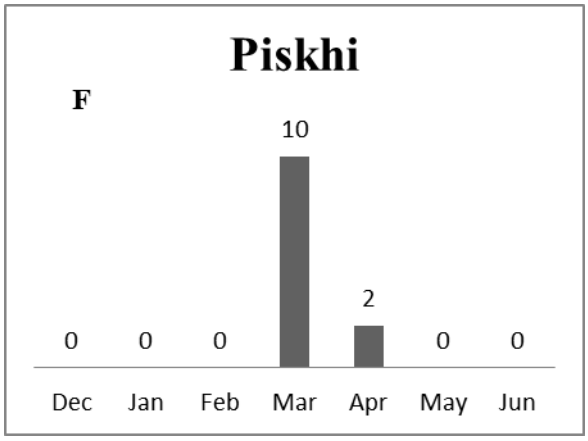

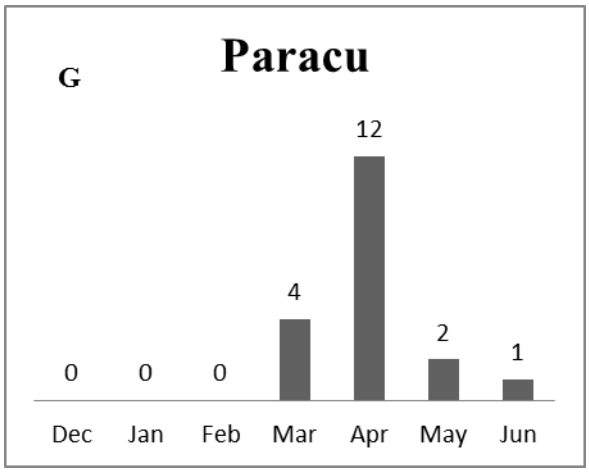

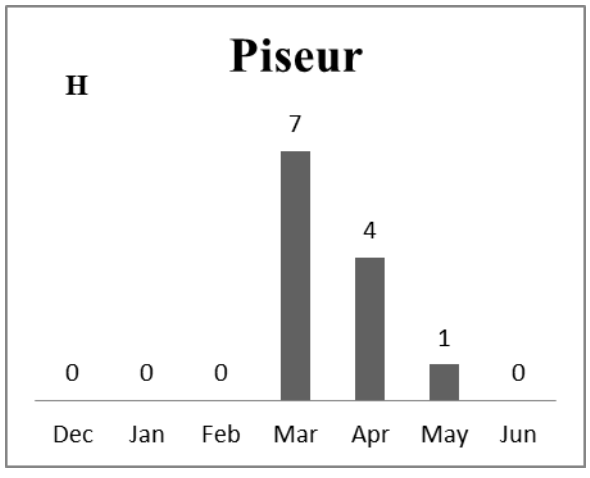

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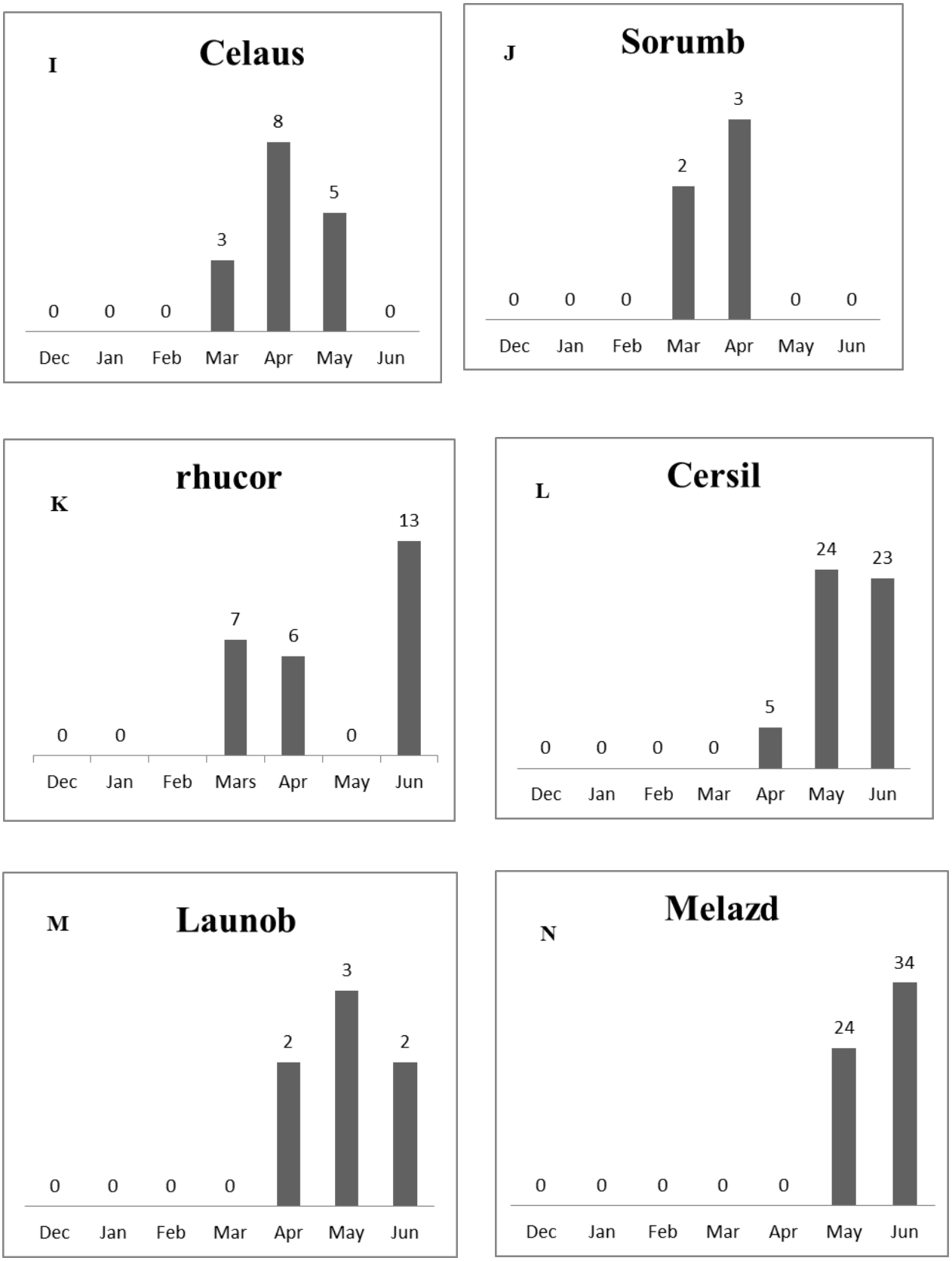

Fig. (4 A to N) : Shows seedlings emergence

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Pyrus syriaca, Robinia pseudoacacia, Cercis siliquastrum

Figure (4 abc); shows seedlings emergence for all three species. *Pyrus syriaca* start seedling emergence on February (38), March (20), April (3) and May (2), Furthermore, *Robinia pseudoacacia* started on February (10) and March (11) seedlings. In addition, *Cercis siliquastrum* started seedlings on February, March, April, May and June (24, 36, 5, 8, 1) respectively.

Pinus brutia, Paliurus spina-christi, Pistacia khinjuk, Parkinsonia aculeate, Pistacia eurocarpa, Celtis australis, Sorbus umbellata, Rhus coriaria

The best seedlings emergence were started on March with (22) seedlings and May (20) seedlings March and April were the best seedlings started for both *pistacia eurocarpa* (7 to 4) seedlings respectively and *pistacia khinjuk* (10 to 2) seedlings respectively. *Celtis australis* initiate on March with 3 seedlings followed by (8) in April and (5) seedlings on May. *paliurus spina-christi* began on March, April to May (16,31 to 2) respectively. *Parkinsonia aculeate* initiate on March with (4) seedlings (12) seedlings on April, May (2) seedlings and (1) on June. *Sorbus umbellata* began on March to April (2 seedlings to 3 seedlings) respectively. Similarly for *Rhus coriaria* which initiate (7) seedlings in March and (6) seedlings on April (see figure 4 defghijk).

Ceratonia siliqua, Laurus nobilis

Figure (4 lm); Shows the best seedlings emergence for both species which start on April to June. *Ceratonia silique* seedlings start growing on April continued to May and June (5, 24, 23) seedlings accordingly. Similarly to *lauru nobilis* growing seedlings start (2, 3, 2) on April, May and June respectively.

Melia azedarach

As it has been previously showed in (see figure 4 n) that the optimal seedlings emergence started on may to June (24 to 34) respectively. If it has been seeded early may cause rodent to the seeds of *Melia spp*. (Hartmann *et al.,* 1997) highlighted that the fall sown may cause rodent large seeds. So, the paper suggestion for nurseries to start sowing seeds on April, because it is native to Tropical rain forest which needs temperature and moisture.

Juniperus oxycedrus and *Crataegus azarolus*

According to research findings there was no seedlings emergence, because there was no germinated seed recorded for this group of tree species. The result of this study showed that these group of tree species need pre-treatment. 30-90 days cold stratification of seed naked recommended by (Piotto and Di Noi 2003) and (Ortiz P., L. 1998). The best pre-treatment for *Crataegus azarolus* suggested by (Ma'an development center, 2017) which is seeds fermentation for few days in its pulp.

CONCLUSION AND RECOMMENDATION

The findings on sixteen native and non native tree species (see table 1) were showed for the first time on all around the Kurdistan region of Iraq and Middle East some tree species have a good germination rate, while some other require pre-treatment to germinate. Moreover, the results showed that each tree species has its own sowing time, because of having a special cells for dormancy and special cells responsible for germination. Thus, this shows for all Nurseries specially Malta Nursery as a suggestion which time is good for sowing seeds in order to obtain better results because early sown may lead to seed rodent and later than showed time in the research may the temperature kill the seeds.

The study suggested that first it's important to conduct a research on the rest of the tree species that is not have been studied in this research. Second, Malta nursery producing seedlings from many non-native tree species for example (*Eucalyptus spp, Melia spp, etc*). It is better to produce from native tree species seedlings such as (*Pistacia spp* and *Pyrus syriaca*), because it has adaptation to the local environment. Furthermore, these native tree species have multiple roles and functions towards improving the urban environment. They can be used for green belts; urban forestry, urban carbon sequestration, air purification and give aesthetic to the area, as well as, the fruits are edible by human and wildlife.

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ژینگەزانینا شینبونا توڤی و دەرکەتنا نەمامێن شازدە جورێن دارا د چاندنا پایزێدا: ئەنجام بو نەمامگەهێن هەرێما کوردستانێ

پوختە

د سرۆشتێدا, دووبارە نۆیبوون و شین بوونا تۆوڤێن جورێن دارا یا جیاوازە ب ئەگەرێ فاکتەرێن ژینگەهیێن هەمەجۆر و پێنگاڤێن (رێکێن) گەشەکرنێ. ب شێوەکێ گشتی تێگەهێشتنا ڤان فاکتەرا ژ بو رێکخستنا شین بوونا تۆوڤا و دەرکەفتنا نەمامکا د دەمێ خودا و هەروەسا بابەتەکێ گرنگە ژبو ژینگەهناسا و رێڤەبەرێن نەمامگەها. دناڤ پێڤریا نەمامگەهاندا چاندنا تۆوڤێن دارا ب زوری د وەرزێ بهارێدایە و ب کێمی د وەرزێ پاییزێدایە, هندەك جارا تۆوڤ پێش وەختە د هێنە چارەسەرکرن داکو رێژا سەرکەفتنا شین بوونا تۆوڤا زێدە بیت ل ڤی جهی کو دەمێ شین بوونێ یێ دەستنیشانکریە کو رووەك ڤێ ئەزموونێ تاقی دکەت د مێژوویا خو یا ژیانێدا. هەرچەندە پێڤریا رێڤەبەرێن نەمامگەهێن هەرێما کوردستانێ دا زانیاریێن باش نینە لدور دەمێ چاندنا تۆوڤا و دەرکەفتنا نەمامکێن جورێن دارێن خومالی و دەرەکی.لەورا ئارمانجا سەرەکی یا ڤێ تۆژینەوێ ژبو پشکنینا سەقایێ شین بوونا تۆوڤانە دگەل بەرهەڤکرنا داتایێن نوی و دیارکرنا باشترین رێك و دەم ژبو چاندنا تۆوڤا کو دەلیڤێ دەت بو دروست کرنا باشترین نەمامگەە پێکهاتی ژ شانزدە جورێن دارێن خومالیو دەرەکی. ئەنجامان نیشا دا کو بو جارا ئێکی سەرانسەرێ هەرێما کوردستانا عێراقێدا دەمێ چاندنا تۆوڤا و دەرکەفتنا شەتلا بێن ڤان جورێن دارا هاتە دیار کرن. زێدەباری هندێ ڤان جورێن دارا جیاوازییەکا زور دیارکر دناڤ دەمێن چاندنێ و دامەزراندنا نەمامگەهاندا. بڤی چەندێ ئەنجامێن مە نرخەکێ بلند یێ هەی ژ بو رێڤەبەرێن

Journal of University of Duhok., Vol. 20, No.1 (Agri. and Vet. Sciences), Pp 50-63, 2017
DOI: https://doi.org/10.26682/avuod.2017.20.1.8

نەمامگەهێن کوردستانێ ییێن حکومی و تایبەت, کو نێدا پیشنیار دهێتە کرن کو چ دەم یێ درست و باشە ژ بو چاندنا تۆوڤا و چ جورێن تۆوڤا پتڤی ب چارەسەریا پێشوەختە هەیە بەری چاندنێ ژبو دەستڤەئینانا نویبوونەکا باشتر.

بيئة انبات البذور و ظهور الشتلات لستة عشر نوعا من الأشجار المزروعة في الخريف: تضمين للمشاتل في منطقة أقليم كردستان

الخلاصة

في الطبيعة، تجديد الانواع وبيئة إنبات بذور انواع الأشجار تختلف فيما بينها بسبب عملية التطوروالعوامل البيئية المختلفة. وكنتيجة لذلك، ان العوامل التي تتحكم في إنبات البذور وظهور البادرات في الوقت و المسافة التي تنثر بذور في المشاتل هو موضوع مهم لكل من مدراء البيئة ومدراء المشاتل. ان معظم المشاتل، تزرع البذور الأشجار عادة في الربيع نادرا ما تكون في الخريف، وغالبا ما تتم معالجتها مسبقا لزيادة إنبات البذور بشكل كبير حيث إن توقيت الإنبات هو غربال انتقائي الذي يختبره النبات طوال دورة حياته. ما لم يكن لدى المديرين في معظم المشاتل في إقليم كردستان معرفة جيدة بوقت انبات البذور وحالة ظهور الشتلات لأنواع الأشجار المحلية. ولذلك فإن الهدف الرئيسي من هذه الدراسة هو معرفة موعد إنبات البذور مع توفير بيانات جديدة وتحديد الوقت الأمثل لنثر البذور الذي يسمح بانتاج شتلات ستة عشر من الأنواع المحليةو الاشجار المدخلة. حيث أظهرت النتائج، وللمرة الأولى في جميع أنحاء إقليم كردستان العراق، هوتوقيت جديدلانبات بذور هذه الأنواع من الأشجار. وبالإضافة إلى ذلك، فإن هذه الأنواع تظهر معنويا ملحوظا في وقت الانبات وتأسيس الشتلات.وبالتالي، نتائجنا لها قيمة عالية لمديري مشاتل كوردستان الحكومية والخاصة كاقتراح الا وهو تحديد الوقت المناسب لنثر البذور والتي تحتاج هذه البذور الى المعالجة الاولية قبل الزراعة من أجل الحصول على أفضل انبات.