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Water Harvesting Through Utilization of Wild Cherry Rootstocks For Production of Some locally grown Plum cultivars In mountains Area Of Sulaymaniyah Region

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ABSTRACT

This study was carried out at Azmar mountains, Sulimaniyah city, Kurdistan region-Iraq, under (rained condition during the seasons 2010 – 2014 for water harvesting through utilizing wild Cherry as a rootstock for production of some common local plum cultivars such as Haloza kadry ,Haloza Zarda Haloza sora and utilizing at the same time shallow, rocky and eroded soils which comprises more than 20% of the lands of Iraqi Kurdistan region.. The results show that it is possible to graft some common locally cultivars of Haolza kadry, Haloza zarda and Haloza sora by cleft method of grafting onto wild pear rootstock which depend entirely on rainfall with minimum water requirement of 450 mm rainfall. Whereas, locally grown pear cultivars mentioned above require under normal irrigation system about 700 mm rainfall/year or 7000 m^3water /ha/year. Consequently the grafting results in water harvesting of about 7000 m3 water /ha/year and makes people more interested in using wild cherry rootstocks for fruit production which resist severe ecosystems in which wild cherry is grown in mountains area in sulaimanyah region .Thus at the same time, it helps in expanding the plums growing area under normal irrigation in plain area of the region.

Keywords: Water harvesting, Rootstocks, Wild cherry, Rained condition , Grafting

INTRODUTION

Wild cherry rootstocks Pyrus Species are among the rare native plants which grow under severe ecosystem in Iraqi Kurdistan region(**Mohamed Ali, J.J.,** 2011.). Photos (1a and 1b) shows some wild pears in the studied area. The mentioned natural plants in such ecosystems undergoes severe stress during summer season due to complete luck of precipitation for more than 4 months

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during Jun to September and little amount of rainfall in May and October. Moreover climate is very hot; dry and with high evapotranspiration 6-9 mm/ day in hot months (Mohamed Ali, 2012). In spite of such severe conditions, the natural flora of the region can survive and give satisfactory yield ; due to some anatomical characteristics such as higher ability of roots (a deep root which is penetrating far below the soil overlying bed) to store and absorb water at high soil moisture potential.

Rainfall fluctuations and periods of rainfall shortage from 1-3 years every five years and even rainfall shortage within the same season, causes serious problems on development of plant flora, agricultural Production, and utilizing, lands in Sulaimanyah govern ate (Mohamed Ali, 2012). Moreover shallow and rocky soils which comprise 20% of Iraqi Kurdistan region are among the serious obstacles facing agriculture development in present time and in distance future in the region. Thus water harvesting under such severe condition is of great importance.

Reports show that 29 species around the world had roots in bed rocks to a depth of 60 m (Jones and Graham, 1993) and weathered rocks can serve as important rooting medium (Arkley, 1981). Many researches have shown that rocks are capable of holding available water for plant use (Stone and Kalisz, 1991).

On other hand Wang et al. (2003) mentioned that environmental drought is a main cause behind the decrease of vegetative growth of fruit trees and lowering of fruit production by more than 50%. The including of drought resistant fruit trees in breeding programs and exploitation of water resources will give an expected increase in fruit production.(Ercisli et al. 2008) observed that nowadays, the most common rootstocks used by fruit growers in Turkey are the wild types of apples, pears, plums, almonds and wild cherry (mahleb) . The usage of these rootstocks is not important only in the increase of productivity, but also important in vegetative growth management and proper acclimatization of budded trees against environmental conditions such as drought and high temperatures.

Although, Kurdistan is rich with water resources but surface water and deep wells are still the major sources of providing irrigation water for agriculture production including orchard production due to disorganizing water resources in the region. Moreover rainfall shortage every 3 years among five years results in minimizing water resources in some years. Therefore ,expanding the orchard area under such condition is difficult .Thus Under above sever ecosystem, biological water harvest through grafting fruits onto wild root stocks is among the effective tools for exploitation the above sever ecosystems through utilizing their wild root stocks in the region including cherry rootstocks.

The objectives of this study are for water harvesting through expanding the plum growing area in mountains area under rained condition besides its growing under normal irrigation system in

plains area through grafting natural wild cherry in mountains area with common plum cultivars in the region.

MATERIALS AND METHODS

Varitiety charaacters

This study deals with grafting of wild cherry which is grow as natural wild root stocks in mountains areas of Sulimaniyah governorate under completely rain condition near the Kolarash village with desirable local plum cultivars of Haloza kadry , Haloza zarda and Haloza sora which have some desirable characteristic such as storage ability , delicious taste and aroma.

Grafting:

On 10th March, 2010 common local varieties namely Haloza kadry ,Haloza Zarda and Haloza sora were grafted onto natural rootstocks of wild cherry with *at Azmer mountains near Kolarash village*, Sulaymaniyah *city,Kurdistan region*- using Clift method of grafting (Hartmann *et al.*, 1997).

Experiment Design:

The experiment was carried out in completely randomized design with 10 replications the obtained data were statistically analyzed using LSD test at 5% level of significant. Means that bearing different letter were significantly different while the averages bearing the same letter were not significantly different.

RESULTS AND DISCUSSIONS

Table (1) shows the average annual precipitation and temperature for the last 10 years and F-parameter suggested by (Lang). The results indicate that F-parameter ranges from 23.16 in Chamchamal weather station to 80.96 in Penjwen. The small value of F-parameter indicates more aridity.

Figure (1) shows the distribution of annual precipitation from 1942-2013 as it was recorded in Sulimaniyah meteorological station which indicates the probability of coming 1-3 drought years every 5-7 years in which precipitation declines to less than 500 mm and in some years to less than 400mm which is considered as the drought years. (Mohamad Ali, 2008)

Figure (2) shows that there were 13 years among 73 years, in which the precipitation was low and not enough for re-activation the springs and Ghanats which are still the main source of

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irrigation orchard fields in the region. Therefore, finding new root stocks in rainfed area which comprises more than 85% of agricultural lands in the region. In addition to that providing supplementary irrigations in plains area might be considered as effective mean toward expanding the orchard growing area.

Figure (3) Frequency of rainfall distribution in Sulimaniyah governorate during 1941- 2013, in which rainfall were represented in the form of histogram. Figure (4) monthly average of relative humidity distribution of Sulimaniyah Meteorological station during 1973-2012. Relative humidity was high during winter and low in the summer while it is convenient in spring months for grafting, therefore most of grafting is usually done in spring months.

Table (2) shows that there are significant differences among the studied varieties in this study in term of the studied characters bud shoot length, bud shoot diameter number of successful grafting. In this study three locally common varieties known as Haloza zarda ,Haloza sora and Haloza kadry were successfully grafted onto wild cherry rootstock. This results agree with those reported by (Ercisli et al. 2008). Who reported that the including of drought resistant fruit trees in breeding programs and exploitation of water resources will give an expected increase in fruit production. Moreover, Wang et al. (2003) mentioned that environmental drought is a main cause behind the decrease of vegetative growth of fruit trees and lowering of fruit production by more than 50%. The including of drought resistant fruit trees in breeding programs and exploitation of water resources will give an expected increase in fruit production.

The cultivar Haloza kadry surpassed the other two varieties in terms of bud shoot length, bud shoot diameter and number of successful grafting .The cultivar Haloza kadry recorded the highest value of bud shoot length (180 cm) bud shoot diameter (75 mm) and number of successful grafting 9 with 90% of successful grafting . The superiority of cultivar Haloza kadry over other cultivars might be attributed to adaptability, comp ability and suitability of environmental conditions. (Hartmann *et al.*, 1997)

The mentioned cultivars started bearing fruits from the second year of grafting, but only 2014 it was recorded. Yield of three plants from each cultivar were collected and weighted as it is presented in Table (3).

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Cultivars	weight (Kg)	weight per plant (kg)
Haloza Zarda	3 c	1
Haloza sora	4 b	1.333
Haloza kadry	6 a	2

The cultivar Haloza kadry gave the highest yield (6kg) which significantly surpassed other cultivars . The lowest yield that was recorded by Haloza zarda which was 3 kg

The results show that it is possible to graft some local common cultivars of plums namely Haloza kadry ,Haloza zarda and Haloza sora onto wild cherry using cleft method of grafting with good percentage of 90% 80% and 60% respectively. Therefore grafting resulting in water harvesting of around 700 mm in comparison with grown the mentioned varieties under normal irrigations which need 700 mm during the growing season. This will help in expanding the grown area of plums in mountains area besides its growing in plains area.

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REFERENCES

Arkley, R.J., 1981. Soil moisture use by mixed conifer forests in a summer-dry climate." Soil Sci.Am.J. **45**: 423-427.

Buringh P., 1960. Soil and soil conditions in Iraq. Republic of Iraq. Ministry of Agriculture, Directorate General of Agriculture Research and Projects, Baghdad, Iraq. 75-110.

Hartmann, H.T., Kester, D.E., Davies, F.T. Jr., Jeneve, R.L., 1997. Plant Propagation. Principles and Practices. 6th Edition. Prentice Hall. Englewood Cliffs. New Jersey. USA.

Jones, D.P., Graham, R.C., 1993. Water holding characteristics of weathered granitic rock in chaparral and forest ecosystems. Soil Sci. Am. J. **57**:256 – 261.

ISSN 2348 – 7968

Karim, T.H., Mohamed Ali, J.J., 2000. Exploitation of shallow sails and rooky lands in the mountain region of Iraqi Kurdistan. J. Zanko,**12** (2) University of Salahaddin.70-85.

Mohamed Ali, J.J., 2011. Utilization of Wild almond root stocks for water harvesting as desertification retardance in Sulaymaniyah region.J. Koya Univ. No. **21**.

Mohamed Ali, J.J., 2008. Natural Resources and its Utilization for Agricultural Development in Sulaymaniyah Governorte . Ph.D. Dissertation, University of Sulaymaniyah.215-230.

Morgan, R.P.C., 1986. Soil erosion and conservation. English Language Society/Longman.

Stone, E.L., Kalisz, O.N., 1991. The maximum extent of tree roots. For. Ecol. Manage. Vol. **46**: 59-102.

Table 1. Some climatological data for weather stations in mountainous regions of Sulimaniyah governorate.

Site	**Meaan annual precipitation (mm)**	**Mean annual temperature (C°)**	**F-parameter * F= P/T**
Bazyan	720.1	17.16	41.96
Halabja	640.0	17.8	35.95
Penjwen	1255.0	15.5	80.96
Sulaymaniyah	658.0	18.5	35.57
Chamchamal	458.5	19.8	23.16
Dokan	719.0	18.9	38.04
Darbandekhan	458.0	19.0	24.01

*F is a parameter proposed by (Lang)

Lang- parameter calculated according to formula, F=P/T , in which P= mean of annual precipitation and T = mean of annual temperature.

Table 2. Bud Shoot length, Bud Shoot diameter, number of successful grafting and Percentage of successful grafting of three common pears varieties after three year of grafting onto wild pear

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Photo. (1a) show wild pear bearing fruits in the studied area at Azmar mountains area near Kola rash Village in 2014.

cultivar	Bud Shoot length (cm)	Bud Shoot Diameter (mm)	Number of Successful grafting	Percentage % of successful grafting
Haloza zarda	160 c	75 c	6 c	60
Haloza sora	170 b	80 b	8 b	80
Haloza Kadry	180 a	180 a	9 a	90

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Photo. (1b) show wild pear bearing fruits in the studied area at Azmar mountains area near Kola rash Village in 2014.

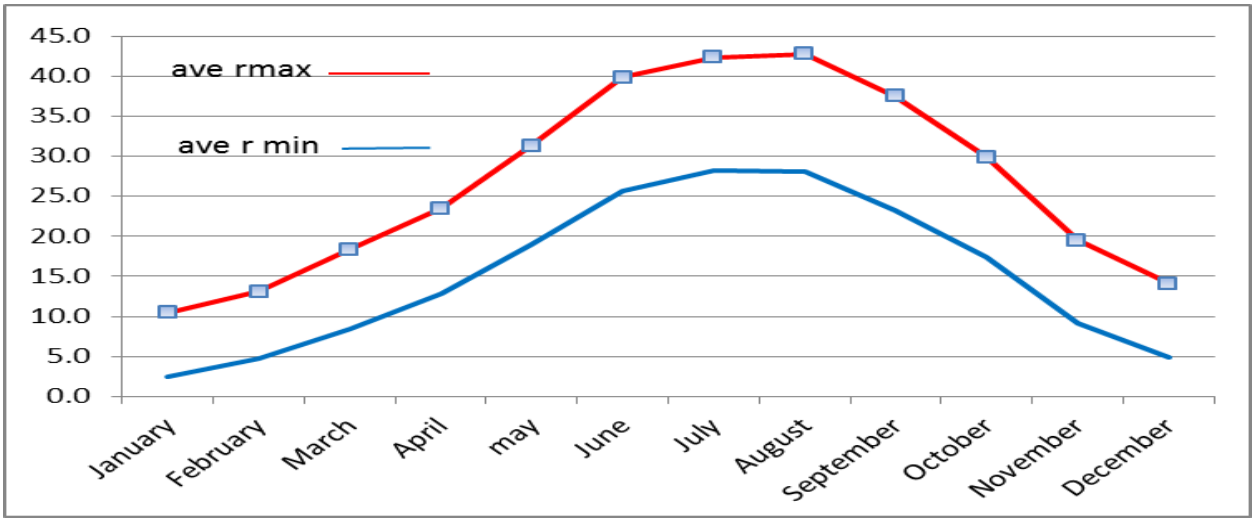

Fig. 1. Monthly average of maximum and minimum temperature as recorded in Meteorological station of Sulimaniyah during 1973 - 2012.

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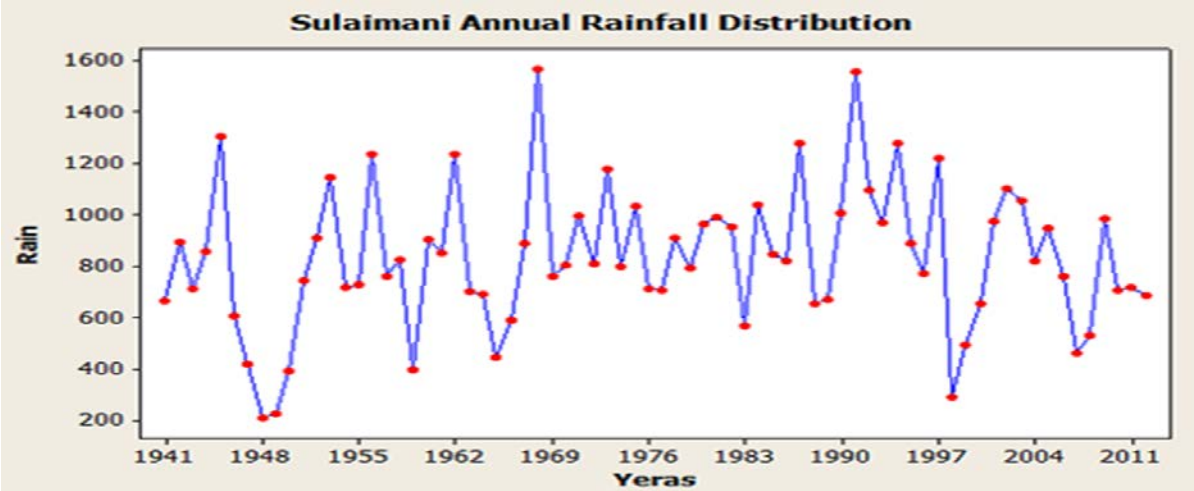

Fig. 2. Annual rainfall distribution in Sulimaniyah Governorate during 1941 – 2013.

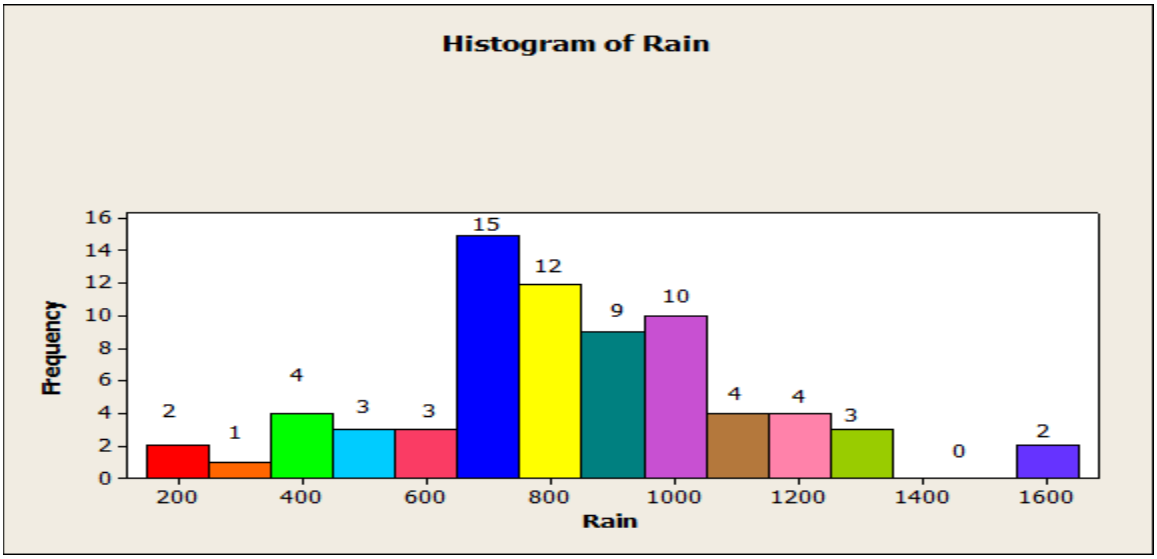

Fig. 3. Frequency of rainfall distribution in Sulaymaniyah governorate during 1941- 2013

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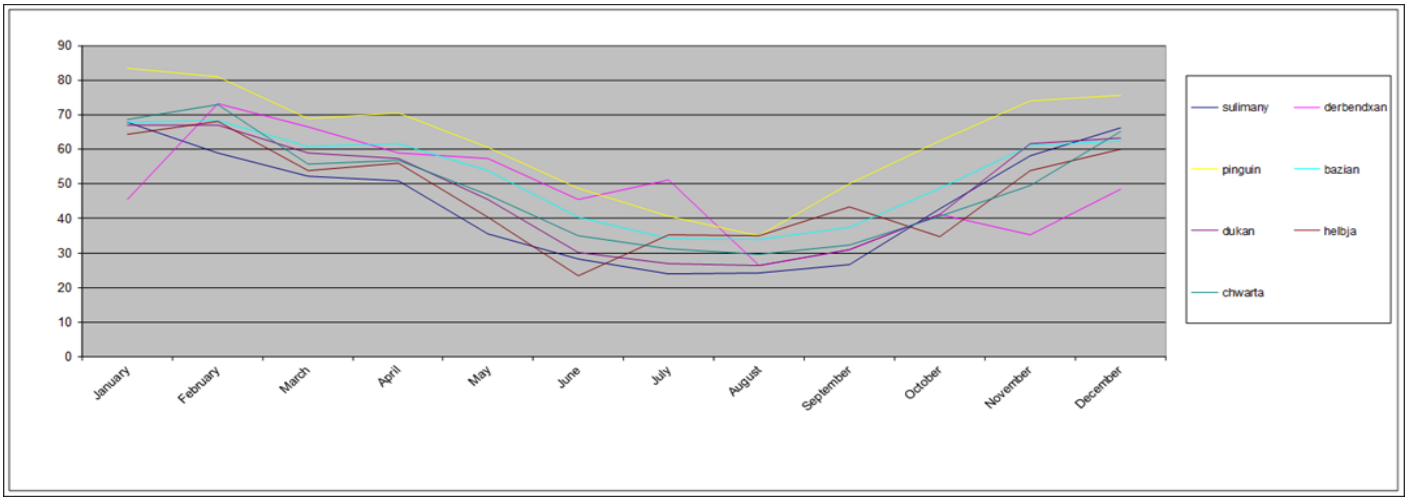

Fig. 4. Monthly average of relative humidity distribution of Sulaymaniyah Meteorological station during 1973-2012.