

Pseudodwarf Disorder in Tissue Cultured Date Palms

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Abstract: Tissue culture date palms (*Phoenix dactylifera* L.) are susceptible to pseudodwarf syndrome. The unnoticed affected palms face death at the end. The pseudodwarfs can be reversed to normal condition through giving proper treatment after identifying the cause. Certain cultivars are more susceptible to this disorder than the other cultivars. In addition to the tissue culture derived date palms, palms produced through suckers and seedling originated palms were also suffered by this disorder in Kuwait. It is confirmed that this disorder not only affect tissue culture date palms but also the normal palms. The method of identification and control measures for this disorder, and reversal of affected palms to normal condition are presented in this paper.

Key words: Pseudodwarf • Date palm • Disorder • Control measures

INTRODUCTION

The date palm (*Phoenix dactylifera* L.) has been traditionally propagated through vegetative offshoots (suckers). The offshoot propagation is slow, time consuming, limited in number, laborious and expensive. The slow nature of traditional vegetative propagation method controlled the expansion in date palm cultivation in many Middle East countries. Now a days, selected superior date palm cultivars are multiplied by tissue culture technique and are available for the growers through commercial date palm tissue culture laboratories. Many new date palm orchards are being established in the date growing countries due to the availability of good quality planting materials. In Kuwait, Kuwait Institute for Scientific Research (KISR) has been propagating superior date palm cultivars since 1996 and supplying palms to the growers. Many new date palm orchards have been established in Kuwait recently through tissue culture derived palms [1] from KISR or imported palms from other countries.

In many of the date palm orchards established through tissue culture derived palms, sudden dwarfing of palms occurred frequently in Kuwait. Since tissue culture is one of the biotechnological tools, growers and researchers are more curious to observe the changes in the tissue culture date palms. Due to the more curiosity over the growth and development of tissue culture-

derived date palms, when they observe the sudden dwarfing on certain cultivars, researchers and growers suspected the method of date palm propagation. Many published reports [2-8] on this sudden dwarfing syndrome failed to give the correct reason for this phenomenon.

Recently, the KISR researchers from the Biotechnology department noticed this syndrome in tissue culture-derived date palms growing in their orchards and also received complaints from the growers. Since this dwarfing occurred suddenly on good growing normal palm at the stage of flowering the growers faced severe loss and this incident made the growers to doubt over the tissue culture method of date palm propagation. In order to clear the doubt of the growers and also to answer the question raised by researchers over this issue, the KISR researchers started to investigate the real cause for this syndrome since the year 2000. During their field survey, the researches noticed this kind of problem on road side trees and other date palm orchards produced either by seeds or through offshoots. This observation made the researches to clear the doubt over the tissue culture method of propagation related to this issue. Since this kind of dwarfism is nothing related to genetic changes, we differentiated it from the real dwarfs as pseudodwarf [9]. The detail of the study on pseudodwarfs and their control measures were reported here in.

MATERIALS AND METHODS

Plant Material: The authors have visited many farms and home gardens based on the complaints and request for investigation from the growers. The infected palms collected from the farms in Kuwait were used for the investigation on this problem.

Dissecting Procedure: The infected palms were carefully dug out from the field using metal diggers and brought to the laboratory and carefully dissected out the leaves one by one from the older to younger using hacksaw and sharp knives. The defects on the fronds and the shoot bud were carefully observed and photographed using Nikon Coolpix 4100 digital camera.

Plant Treatment for Recovery: Some of the infected palms were identified and carefully the older leaves were removed in order to apply fungicide and insecticide. After cleaning the basal part of the infected palms, 1% Benlate fungicide solution and 2 ml/l Malathion insecticide were added carefully on the tree top. This treatment was carried out twice per month and continued up to 3 months duration.

Some of the palms were carefully removed from the original site, cleaned, treated with fungicide and insecticide, and transplanted in another good planting site. Both on the spot treated palms and transplanted infected palms after treatments were carefully maintained and observed periodically. All the changes in growth and frond morphology were photographed and recorded.

RESULTS

The main external symptoms that were observed on the pseudodwarf during the dissection (Figs. 1 & 2) were malformed fronds, leaves with incomplete leaflets, scratches and furrows on the leaf rachis, and sudden or gradual dwarfing of new leaves. In many cases, the tree showed a rosette of little leaves at the shoot tip. During our dissection of some of the affected palms, we noticed many common features such as: insect larval frass (faecal matter), furrows (Fig. 3) and scratches on the lower side of the leaf rachis on short length or extended up to the leaf base, holes on the rachis and leaf sheaths, 'V' cut on the leaf rachis and inflorescence stalk, insect larvae, partially damaged or completely damaged axillary shoot buds and floral buds, wounds on the stem tissues, and fungal



Fig. 1-6: *Phoenix dactylifera* L. pseudodwarfs and treatment

Fig. 1: Dwarf date palm; Fig. 2: Treating the affected palm; Fig. 3: Frond with insect frass and furrow on the rachis; Fig. 4: Dwarf turned normal after treatment; Fig. 5: New axillary shoot produced from the pseudodwarf after the removal of the main meristem; Fig. 6: A pseudodwarf date palm turned normal after treatment.

All the treated palms at the initial stages of dwarfing were recovered from the problem and started producing normal fronds after 3 months period. The new fronds were normal and without any malformation on the pinnae or rachis. They produced flowers and fruits and totally turned to normal palms within 2 years period (Figs. 4-6). This sudden dwarfing symptoms on tissue cultured date palms were noticed only on certain cultivars like Succary and rarely on other cultivars. The larvae collected from the affected palms were identified as *Arenopsis sabella*.

DISCUSSION

Based on our observations, we suspected on the particular larvae commonly noticed on all the affected palms as the primary cause for this problem. We collected those insect larvae and conducted an experiment by placing the collected larvae in closed boxes containing young date palm fronds and left overnight. During our observation on the following day we noticed the same type of symptoms appeared on the young fronds of the affected palms. Thus we confirmed that the main cause for the dwarfing of palms as this insect larvae infection. In order to identify the larvae, we maintained the larvae until they metamorphosed into the adult insect. We identified the insect as *Arenopsis sabella*, the grater date moth belonging to the order Pyralidae [9].

This insect *Arenopsis sabella* Hamps. (grater date moth) lays eggs at the base of the young leaves of the date palm. The larvae eat the tender part of the young leaf rachis and enter inside the stem tender tissue. This usually happens in the month of September-October and the adult insect comes out from the first generation larva lays eggs inside the crown of the date palm. During the winter months (December -February), the caterpillar comes out from the eggs stays inside a protected cover (cocoon) inside the crown of the palm tree. As soon as the climate is favourable in March-April the second generation larvae easily enter inside the tender parts through the furrow made by the first generation larvae and damages the young leaf bases and also flower stalks. This damage caused at the shoot meristematic region by the larvae makes the tree to produce malformed small fronds or little leaves and makes the sudden dwarfing.

The presence of this insect can be identified through the following symptoms: 1. 'V' cut on the leaf rachis or inflorescence stalks, 2. Insect frass on the leaflets or rachis or leaf sheath, 3. Scratches on the leaf rachis, 4. Irregular leaflets on the fronds, 5. Malformed leaves or leaflets, 6. Holes and furrows with insect frass on fronds or flower stalks and spathe and 7. Malformed offshoots.

Once the growers notice any of the above symptoms on their palms, they should take necessary precautionary measures to control this insect through spraying with chemicals or insect traps or biological methods to control the pseudodwarfs. In our laboratory, we have done it practically on several cases and the affected palms are turned to be normal and producing fruits. The severely affected trees also produced axillary shoots from the leaf axils when the shoot tip was removed during the treatment.

In conclusion, the sudden dwarfing occurred on tissue culture derived date palms are not due to the genetic change but due to environmental problems. This phenomenon may occur due to the moth *Arenopsis sabella* or fungal infection on the shoot meristematic tissue or damage on the root system by any means. This is not only related to tissue culture derived date palms but also the palms produced by other conventional method of propagation. To our knowledge and practical experience on tissue culture propagation since 1995, the tissue culture derived date palms through somatic embryogenesis produce true-to-type fruits if it is induced by proper culture media and culture techniques. Even though this phenomenon occur in normal palms, it is more obvious on tissue culture derived palms because of more curiosity shown over the tissue culture-derived palms during their growth and development by the researchers and growers. Another issue over this phenomenon is cultivar specificity. Some growers complained this phenomenon occurred only in a particular cultivar. However, we observed this phenomenon in date palm cultivars Anbarah, Khlas, Succari and Sultana. The cultivar specificity reported by the growers may be due to the more susceptibility of that particular cultivar towards the insect larvae. The cultivar specific susceptibility towards this phenomenon is under further investigation.

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