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مركز اليونسكو للتعليم والتدريب في التقنيات الحيوية



## Endemic seeds: Importance and Improvement Approaches

Prepared by:

Dr. Omar Darissa

Majduleen AlRajabi

Mukbel Abu Jeesh

## **The UNESCO Biotechnology Educational and Research Center**

The center was founded in 1995 at Bethlehem University with the support of UNESCO Biotechnology Action Council as one of five centers in the world for the development of biotechnology research in developing countries. The Center was directed by Dr. Naim Iraki till 2011 and since then by Dr. Omar Dar Issa. Among the most important research areas carried out at the Center those concerned with the development of the agricultural sector including biological control and the study of biodiversity in Palestine, fungal and plant viruses, development of resistant plants to biotic and abiotic stresses. In addition, the center provides services to farmers in coordination with the Ministry of Agriculture including the detection of plant pathogens such as viruses and bacteria by using modern molecular techniques. In addition, the center provides training for Arab and Palestinians researchers, agronomist and graduate students by organizing intensive lecture programs, workshops, and courses in the aforementioned areas. Moreover, the Centre collaborates with several local and regional institutions and organizations including PARC to improve the agricultural sector in Palestine through research and community out-reach services.

## Endemic seeds: Importance and Improvement Approaches

### Introduction:

The main goal of writing this brochure is to increase the public awareness of the importance of the Palestinian endemic seeds and provide the results of a preliminary experiment about the effect of soil type and growth conditions on the productivity of two local cultivars of Egyptian cucumber and other two of zucchini. This experiment was conducted based on the observations and records made by the farmers under our supervision. In some cases, the treatments were incomplete because some farmers end their season earlier than expected or because of the existence of additional variables, other than the soil type, in some fields which render the results scientifically incomparable. Despite that, our team was still able to collect and statistically analyze part of the results solely to be able to produce initial indications. It is worth mentioning that this experiment should be repeated next year following the scientific standards in order to be publishable. In this brochure, we used the term “endemic seeds” to describe Baladi seeds and “hybrid seeds” to describe other commercial seeds.

### Endemic seeds versus commercially hybrid seeds:

Endemic seeds have several advantages over hybrid seeds, these include the followings. First, endemic seeds are well adapted to the local climate and pathogens which may result in high resistance to biotic and abiotic stresses of the region. This is very true when the farmers keep on producing seeds and grow them for several seasons. The fact that many Palestinian farmers have ignored the endemic seeds and have been using hybrid seeds for several years resulted in the susceptibility of the stored endemic seeds to the changing stresses. This is because the lack of natural and artificial selection in seeds that have been stored for long times. Second, farmers need more doses of chemical pesticides to sustain a healthy hybrid plant when compared to plants grown from endemic seeds. Thirds, the cost of hybrid seeds that have resistance for a certain disease are much higher than endemic seeds which are produced by the farmers every year at a trivial cost. Fourth, endemic seeds could be stored for the future seasons. This is not possible with commercial hybrid seeds. Fifth, most of the endemic cultivars do not need much water and fertilizers because their roots go deeper in the soil compared with hybrid cultivars. Another reason for this is attributed to the fast growth of hybrid cultivars which consumes soil resources and force farmers to apply more water and fertilizers. Finally, although the productivity of hybrid cultivars is higher than of endemic ones per harvest, the period of fruit production of endemic cultivars is longer and may reach up to four months compared with two months in hybrid cultivars.



## **Factors affecting seed germination, seedling development and productivity:**

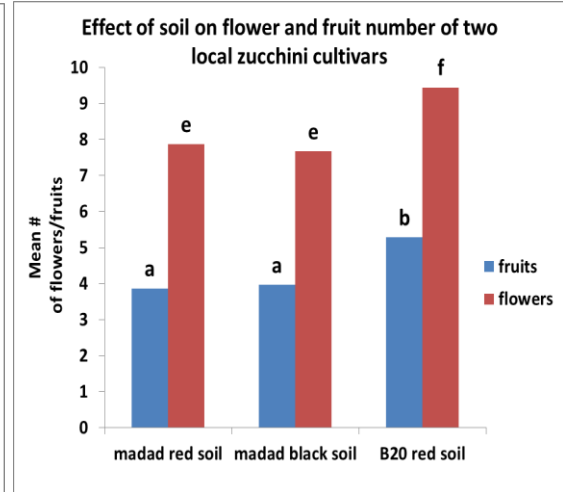
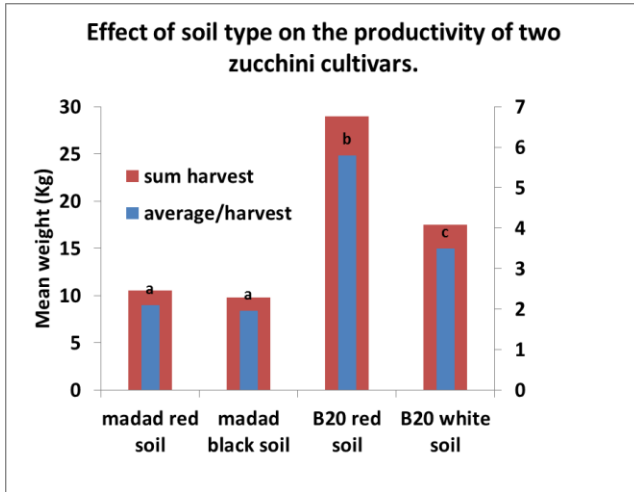
In general, seed germination and fruit productivity could be affected by the varying environmental conditions. Variations in the percentage of seed germination and fruit production might be even noticed among cultivars of the same species grown under the same conditions. This might be related to differences in the genetic makeup of the cultivars and in the history of the exposure to a certain selection pressure. This applies to the endemic seeds rather than hybrid seeds because they follow the vertical inheritance laws and continually adapt to the diverse local habitats over generations. Unfortunately, the replacement of endemic seeds by hybrid seeds for several generations may have changed their ability of resisting the emerging diseases and their fitness to the changing environmental conditions. Therefore, it is important to reevaluate this relation and to reveal possible physiological variations among the endemic cultivars as a way to improve their productivity and convince farmers of reusing them.

Farmers should take into consideration the following rules when grown a plant from a seed. In general, seeds need warm temperatures and moderate humidity to germinate since elevated humidity encourages the growth of fungal pathogens that might damage the seeds. Small seeds are hard to germinate in the field since light is necessary for the embryo development. Therefore, farmers usually buy them as seedlings that have been produced at nurseries. Seedling development should occur in warm temperature since cold soils and high atmospheric temperatures slow their growth for several physiological reasons. Seeds of different species should be grown in the right time to achieve flowering while the day is still long and warm. Seeds should be collected from selected strong plants with the desired phenotypes at certain times. They should be dried and stored in a dark, cold and dry place. The common practice is to store seeds in dark bottles provided with hygroscopic substances to prevent the growth of germs.

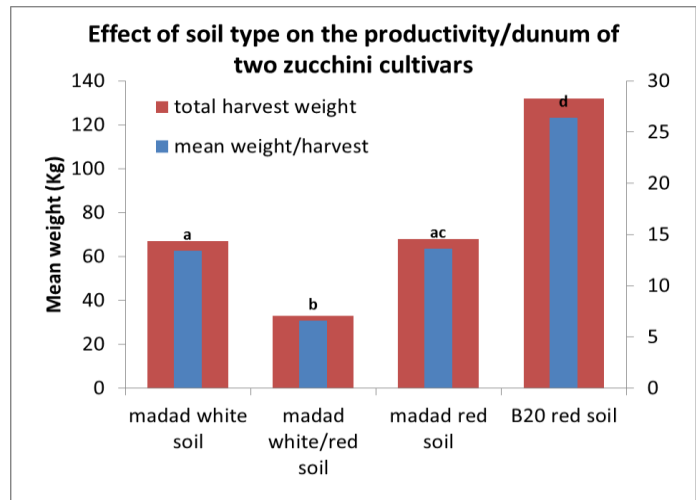
## **A preliminary experiment conducted by PARC and the UNESCO BERCEN at Bethlehem University to study the effect of soil type on the productivity of two Zucchini and two Egyptian cucumber local cultivars.**

The possible effect of soil type was studied on the seed germination, flowering, and productivity of zucchini cultivar B20 and cultivar madad. The results illustrated in the following two figures represent the mean number of flowers and fruits (right) and fruit weight (left) of 20 plants. It was concluded that: First, B20 has higher percentages of all studied criteria than madad regardless of the soil type. Second, productivity of B20 is higher when grown in red than in white soil. Third, the soil type has no significant effect on any of the studied criteria in madad cultivar.

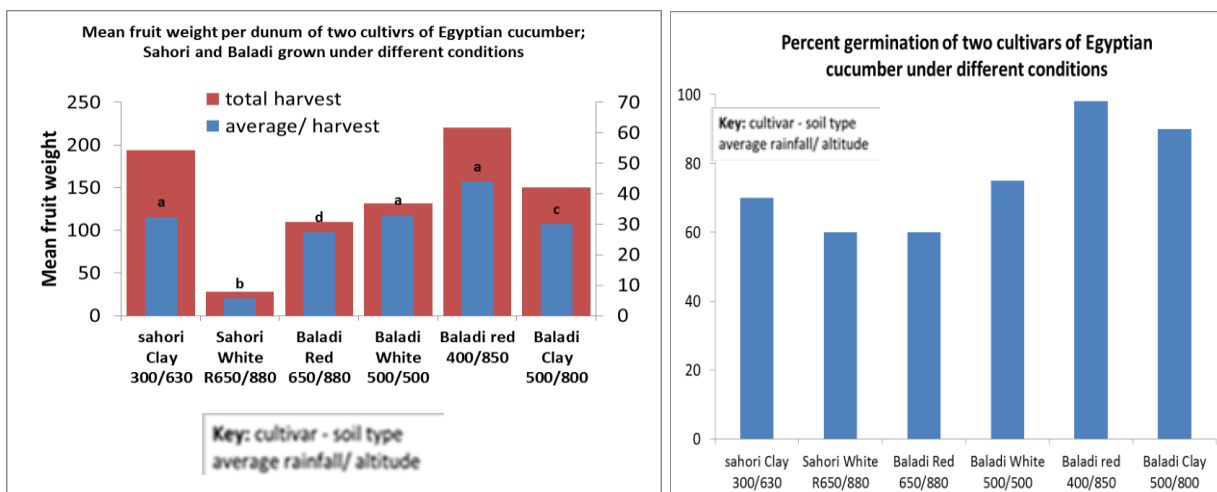
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The following figure shows the productivity/dunum of each of the two zucchini cultivars:



The effect of soil type on the productivity per dunum of the Egyptian cucumber cultivars Baladi and Sahori was revealed in a second experiment. The results in the following figures showed the followings: First, the percent of seeds germination of Baladi cultivars was higher of Sahori in red clay soils. Second, the highest productivity of Sahori cultivar was achieved when it was grown in a field near the place where this cultivar was originated. This clay-soil containing field is located in AIObeidieyeh at altitude of 630m, and an average rainfall of 300mm. The productivity of the same was much lower when it was grown in a mixed soil (red/white), at altitude of 880m and an average rainfall of 650mm (AlKhader). Third, the highest productivity for the Baladi cultivar was in red-clay soil at altitude of 880m and average rainfall of 400mm. This is accordance with the fact that this cultivar has been cultivated in such conditions in the past.



## Summary and recommendations:

This study is no more than a preliminary trial to test whether the soil type has any effect on the productivity of the studied cultivars. Although, when studying one variable (i.e soil type) all other factors should be kept constant, this was not entirely feasible in this study because of the limited number of farmers who agreed to use their lands for the experiment. Despite that, the results provide preliminary indications of the presence of productivity variations among cultivars of one species grown in different soil types. Therefore, in the next season the experiments should be repeated again taking into consideration the followings:

- Lands with the desired characteristics according to a scientifically designed plan should be available in advance.
- More cultivars and species should be included.
- The data/results should be collected on a regular basis according to a time-plan by an agronomist rather than by the farmer. It should be the agronomist responsibility of assuring that farmers do not include extra treatments of the plants during the experiment such as unplanned irrigation or use of pesticides.

