

Architectural study of the young date palm root system (*Phoenix dactylifera* L.)

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1- Introduction

The architectural analysis of the root system, is necessary to describe its principal functions (Jourdan and Rey, 1997). The study of date palm root architecture is important in the cultivation of date palm which is traditionally carried out in oasis on three levels (Battesti, 2004).

2- Experimental techniques

In order to characterize root system architecture, two parallel experiments were conducted: one so-called destructive in nursery bags (Fig. 1) from which roots were sampled regularly, and the another one called dynamic in rhizotron (Fig.2) whereby root growth was measured over time. The topology and typology of root systems were described.

Radicle diameter and radicle elongation were measured regularly on seedlings grown from seed (0 to 6 months). RhizoDigit software (©CIRAD) was used to digitize root observations (Fig. 3) and to compile data for statistical analyses (Fig. 4 and 5).

Three lateral root types are present on the radicle : long RII at the basis, RII medium and RII short covers the entire axis with variable proportions. This distribution gives an acropetal structure to the root system (Fig.7 and 8).

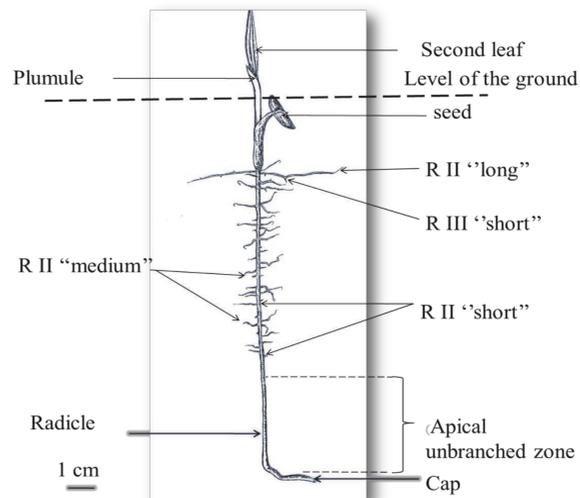


Fig. 7. Root system of the date palm seedling, 64 days after germination.

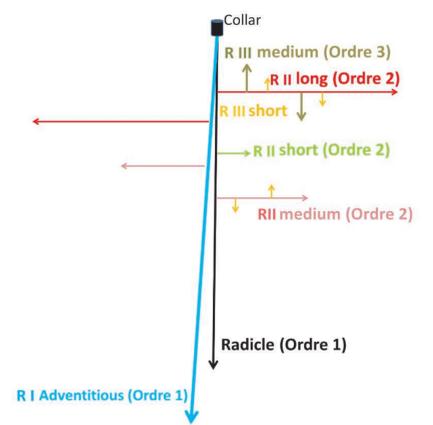


Fig. 8. Root system architectural unit, 6 months after germination.

4- Conclusion

The description of the architecture and the development of date palm's root system during the juvenile phase (0 to 6 months) revealed :

- the existence of seven root types having distinct characteristics over 3 different topological orders (Fig.8) and Table 1;
- the establishment of root types is progressive with time (ontogeny);
- the root growth speed is variable depending on root type and their diameters;
- the radicle had a determinate growth without «pruning» (i. e. without disappearance).

Table 1 : Architectural Unit of a young root system of a 6 month old date palm.

Root types	Order	Growth	Ramification	Origin	Date of appearance (D+ days after planting)	Diameter at insertion (mm)	Geotropism
RI Radicle	1	undefined (0 to 6 months), down	yes	embryonic	Just after germination	4,61	Orthogeotropic (positive)
R1 Adventitious	1	Undefined, down	yes	stem	D+150	5,25	Orthogeotropic (positive)
R2 long	2	Undefined, lateral, horizontal	yes	Radicle, R1	D+70	0,9	Plagiogeotropic
R2 medium	2	Undefined, lateral, horizontal	yes	Radicle, R1	D+70 – D+80	0,8	Plagiogeotropic
R2 short	2	Defined, any direction	no	Radicle, R1	D+90	0,7	Ageotropic
R3 medium	3	Defined, any direction	yes	R2 long	D+90	0,3	Ageotropic
R3 short	3	Defined, any direction	no	R2 Long and medium	D+90	0,3	Ageotropic

5- References

- Battesti V., 2004. Odeur *sui generis*. Le subterfuge dans la domestication du palmier dattier (Tassili n'Ajjer, Algérie). *Anthropozoologica* 39 (1) : 301 - 309
Jourdan C. et Rey H., 1997. Architecture and development of the oil-palm (*Elaeis guineensis* Jacq.) root system. *Plant and soil* 189 : 33 - 48.

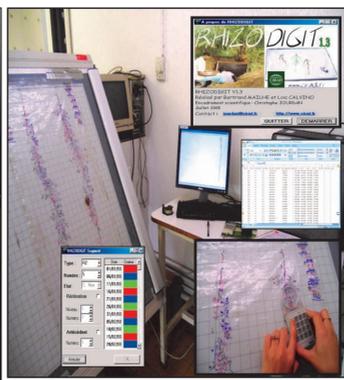


Fig. 1. Destructive study of date palm seedling (in nursery bags).

Fig. 2. Dynamic study (in rhizotron).

Fig. 3. RhizoDigit software (©CIRAD) digitalization.

3- Results

During the juvenile stage, the growth in diameter along the radicle is substantially constant and decreases near the apex (Fig. 6).

All the results of architectural analyze are summarized in the architectural diagram (Fig. 8) and in the architectural unit (Table 1).

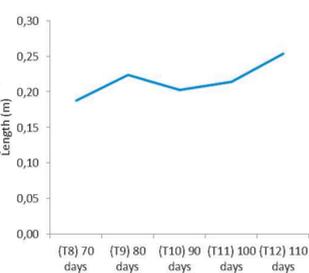


Fig. 4. Radicle root rate (destructive study).

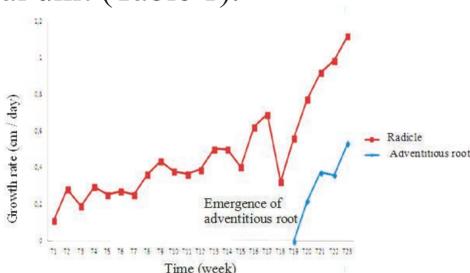


Fig. 5. Root growth speed (radicle and adventitious root).

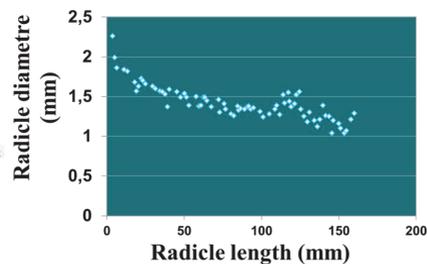


Fig. 6. Evolution of the diameter of the radicle according to its length (64 days).



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