RESEARCH REGARDING THE EQUIPMENT OF WATERING PIPE AT LOCALIZED IRRIGATION BY PERFORATED TUBES

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ABSTRACT

The paper presents the hydraulic characteristics of distributors which may be used at localized watering by perforated pipes and their implication in the modality of equipment.

Key words: distributor, equipment, hydraulic, watering pipe.

INTRODUCTION

Two types of installations for localized irrigation are being produced in Romania: with perforated tubes (IUTP–1) and with dripping (IUP–1).

Romania are producing tubes I with nominal pressure 0.25 Mpa, with τ = 21 kgf/cm^2, shock resistant, dimensionally, stable at temperature (at 108°C with length variation of ± 2%, for maximum temperature of environment of 40°C) and with k_1 = 0.010 mm.

This tube is realized in four type-dimensions for nominal diameter (Dn) equal to the exterior diameter: 16 mm, 20 mm, 25 mm and 32 mm. The perforated tube with the length bigger than 50 m is telescopically sized starting with the bigger value.

MATERIALS AND METHODS

Six types of distributors were studied in laboratory and experimental fields, in view of the optimum equipment of the perforated tubes. The main constructive characteristics are the following (Nicolescu et al., 1988):

1) Right exterior cylindrical discharge nozzle made of PE_{id} with L = (3*d) and d = 1.5; 1.7; 1.8; 2.0; 2.5 mm.

2) Convergent-conical discharge nozzle made of PE_{id} with $\alpha = 10^0, 20^0, 30^0, 40^0$ and d = 2.0; 2.5; 3.0 mm.

3) Short hydraulic pipe, made of polypropylene (PP) with d = 2.7 mm and L = 0.10–1.0 m (10 type dimensions, with pass of 1.0 m).

4) Self adjustable distributor with elastic element made of rubber and distributor made of PVC with the flow section diameter of 3 mm, 4 mm and 5 mm.

5) Self adjustable distributor with flexible diaphragm of rubber with the flow section diameter of 3 mm.

6) Discharge nozzle with dissipator made of PE_{id} including a cylindrical nozzle with diameter of 1.5 mm; 1.8 mm; 2.0 mm and 2.5 mm.

RESULTS AND DISCUSSION

In accordance with the research results, the distributor type nozzle with dissipator was adopted and the characteristic equations of the general form $Q = k*H^x$ were established and with the following particular forms [1]:

d = 1.5 mm; $Q = 3.31504 * H^{0.654881}$; $\rho = 0.9777$ (1)
d = 1.8 mm; $Q = 3.38143 * H^{0.689998}$; $\rho = 0.9481$ (2)
d = 2.0 mm; $Q = 4.65352 * H^{0.676552}$; $\rho = 0.9864$ (3)
d = 2.5 mm; $Q = 3.15005 * H^{0.817172}$; $\rho = 0.9958$ (4)

where:

d – diameter of the characteristic flow section, in mm;
k – constructive - hydraulic characteristic of distributor;
H – the service pressure, in MHW;
MHW – meter head of water (1 MHW = 0.01 Mpa).

The weight of nozzle with dissipator is 6 g and presents the following characteristics:

– stability of the parameters (k) and (x);
– satisfaction of the tolerance of non-uniformity flow rate;
– increasing safety operation;
– high rate of fiability;
– low sensibility to quality of water

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irrigation;

– low specific weight.

The localized irrigation with IUTP-1 is recommended for vine and fruit tree plantations localized on soils with stable flow rates of infiltration of 2–16 cm^3 (s* m) and with the base rock to a depth bigger than 0.80 m.

CONCLUSIONS

It is recommended to utilize the distributor type nozzle with dissipator.

The optimum pressure of operation is 0.8–0.14 MPa, with minimum limit of 0.05 MPa and the maximum limit of 0.16 MPa.

The irrigation technology with perforated tubes leads to:

– a water economy of 20–30% compared to sprinklers or irrigation through furrows;

– reduction of energy consumption for irrigation pumping;

– maintenance of a minimum moisture differentiated limit;

– provide a better conservation of soil properties;

– reduction of the number of workers for watering and the metal consumption.

REFERENCES

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Table 1. Influence of aluminum ions, in reaction mixture, on the level of saccharasic activity in a reddish-brown soil fertilized with compost with different quantities (glucose+fructose-mg/100 g soil dw/24 hours)

A- Factor	B – Factor – COMPOST (t/ha)								Average (A)	
	b1-0	%	b2-0	%	b3-0	%	b4-0	%		%
a1–without Al^{3+}	b 3287	100	b 4028	100	b 2579	100	b 3472	100	b 3341	100
a2- with Al^{3+}	a 4228	129	a 5019	125	a 3472	135	a 4528	130	a 4312	129
Average (B)	3757 c		4523 a		3025 d		4000 b			

LD P	5%	1%	0,1%
A	291	673*	2143
B	101	142	201*
AB	302	628*	1799
BA	144*	201	284

Table 2. Influence of aluminum ions, in reaction mixture, on the level of saccharasic activity in a chernozem mineral fertilized or manured with farmyard compost (glucose+fructose-mg/100 g soil dw/24 hours)

A- Factor	B – Factor – COMPOST (t/ha)										Average (A)	
	b1-0	%	b2-$N_{32}P_{32}$	%	b3-$N_{94}P_{96}$	%	b4-$N_{128}P_{128}$	%	b5 compost	%		%
a1–without Al^{3+}	b 1564	100	b 1496	100	b 1459	100	b 1401	100	b 1732	100	b 1530	100
a2- with Al^{3+}	a 1686	108	a 1581	106	a 1684	115	a 1589	113	a 1864	108	a 1681	110
Average (B)	1625 b		1538 d		1571 c		1495 e		1798 a			

LD P	5%	1%	0,1%
A	7	17	54*
B	14	20	27*
AB	19	28	45*
BA	20*	28	39