Assessing the Performance of Different Systems to Prevent Root Intrusion in Subsurface Drip Irrigation

Vincenzo Alagna1\*, Loris Franco2, Giuseppe Provenzano1

1 Dipartimento di Scienze Agrarie, Alimentari e Forestali, Università degli Studi di Palermo, Viale delle Scienze, Edificio 4, 90128 Palermo, Italy

2 Irritec s.p.a., Via Gambitta Conforto, 98071 Capo D’Orlando, ME, Italy

\* Corresponding author: phone: +39 091-23865610, fax: +39 091-484035 E-mail: [vincenzo.alagna01@unipa.it](mailto:vincenzo.alagna01@unipa.it)

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**Abstract.** The combination of subsurface drip irrigation (SDI) with management strategies such as the Regulated Deficit Irrigation represents a promising solution to increase water use efficiency. However, one of the main concerns of SDI is related to the root intrusion into the emitters’ labyrinths, which can affect the water distribution uniformity. The solutions adopted by the emitters’ manufacturers involve the addition of physical devices or introducing chemical substances into the emitters during the manufacturing process.

The objective of the research was to assess the performance of different methods to prevent root intrusion in commercial emitters recommended for subsurface drip irrigation systems, based on a four-year experiment (2018-2021) in a citrus orchard.

The field was split into two plots managed according to different irrigation strategies, i.e. Full (FI) and Deficit Irrigation (DI). Each plot was then divided into four irrigation sectors, three of which irrigated with co-extruded laterals buried at 30 cm depth and containing the same self-compensating emitter model impregnated with different chemicals (two different herbicides, He1, He2 and Copper, Cu); the fourth sector was irrigated with a different self-compensating emitter and used as control (C). Emitters were characterized by nominal flow rates of 2.3 and 2.1 l/h at a pressure of 150 kPa. Each plot was also equipped with a pressure regulator, water meter and manometer installed at the sector inlet.

After a total of about 425 and 340 working hours in FI and DI plots, the sector with Cu emitters was characterized, on average, by the strongest reduction of the discharged flow rate, with a decrease of about 13% of the initial value and the consequent increase of the operating pressure from 150 to 200 kPa. On the other hand, the reductions of average flow rate in the sectors with emitters containing He1 and He2 resulted lower than 0.5% with an increase of inlet pressure from 150 to 175 kPa. An intermediate behaviour characterized the C emitter, for which the reduction of flow rate resulted slightly higher than 6% with a rising operating pressure from 150 to 200 kPa. The study, still ongoing, provided useful information on the efficacy of the tested systems to protect the emitters from root intrusion.