leaf samples collected in July, from two different experimental plots with significant difference in disease incidence, showed that leaf nitrogen levels were within the optimal range and not statistically different, and did not explain the difference observed in disease incidence.

Keywords: Almond, Hull rot, Rhizopus stolonifer, Aspergillus niger

#117: New fungicides for managing Phytophthora diseases of almond

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Phytophthora diseases of almond have become of greater concern in recent years especially in new plantings with reports of new species occurring in California. Previously, only phosphonate and phenylamide fungicides were available for their management. Four new fungicides, oxathiapiprolin, fluopicolide, mandipropamid, and ethaboxam, have or are pending registration as soil treatments on almond in the United States for managing Phytophthora root and crown rots, as well trunk cankers. Because they each have a unique mode of action or FRAC Code, they can be used in a sustainable anti-resistance rotation program. These fungicides are highly toxic in vitro against multiple species of *Phytophthora*, and they reduced Phytophthora root and crown rot of almond to extremely low levels in several field trials using inoculated trees. Oxathiapiprolin binds to dry soil and was only very effective when applied to pre-wetted soil. Thus, it should be chemigated towards the end of an irrigation cycle to allow penetration into the root zone. Oxathiapiprolin, mandipropamid, and fluopicolide demonstrated absorption by roots and acropetal systemic movement through the xylem after soil application. This was substantiated by reduced lesion size in stem inoculations of potted trees that were treated by soil applications as well as by bioassays of root, stem, and leaf extracts. Using an adapted Bromilow model that is based on the partition coefficient logP that indicates the lipo- or hydrophilicity and the acid dissociation constant pKa, mobility of a compound in a plant can be predicted. Based on the logP/pKa values for mandipropamid, oxathiapiprolin, and fluopicolide (3.3/0, 3.6/0.78, and 3.26/0, respectively), limited xylem mobility is predicted, and this was supported by our results. Oxathiapiprolin was registered for field use in 2021. Currently, fluopicolide and ethaboxam are in the federal IR-4 program for registering pesticides on specialty crops. Mandipropamid is planned for nursery container use.

Keywords: Disease management, soil-borne pathogens, root and crown rots, trunk cankers

#28: Screening of natural resistance sources to fungal diseases in Prunus rootstock selections

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Current cultivation systems in almond, besides demand rootstocks environmentally adapted, also require rootstocks tolerant to certain fungal diseases present in growing areas. In this work, two selections belonging to the *Prunus*-rootstock breeding program of CITA - Agromillora (Spain) were chosen to evaluate their level of resistance against two of the main soil-borne pathogens of the crop, such as *Armillaria mellea* and *Phytophthora* spp. In addition, four commercial rootstocks were also included in the resistance assays: 'GF-677' and 'Garnem' for *Phythopthora* experiment; and Rootpac® 20 and Rootpac® R for *Armillaria* treatment. A total of ninety plants for each experiment were distributed in 30 pots of 3 m^3 of volume with a mix of 30% turf, coconut fiber and 20% sand (three plant per pot). Experiments were carried out in the open air with an irrigation and fertilization regime appropriate to the needs of the plants at all times, for 120 days. After that period, the phenotyping of the response against the two pathogens of the different combinations tested was performed.
For *Phytophthora* assays, presence and length of cankers were recorded and compared, while in the case of *A. mellea*, amount and extend or root and crown lesions were considered. Results were then compared with those observed in commercial rootstocks artificially inoculated with the mentioned pathogens, in order to define the behavior of each of the genotypes tested as sensitive or tolerant to both pathologies. The implementation of screening assays to identify natural resistance sources against biotic stresses associated with the crop contributes to the incorporation of new descriptors to rootstock breeding programs.

Keywords: biotic stress, hybrid rootstock, phenotyping, rootstock breeding, soil-borne pathogens

#146: Selection of new almond rootstocks with resistance to Phytophthora in California

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Many California almond orchards have sustained high incidence of tree death caused by *Phytophthora* spp. Depending on the *Phytophthora* sp. and environmental conditions, tree death resulted from rootstock crown and root rot (CR), scion attack (S), or both. Problems with CR have intensified, especially where the industry has shifted from predominant use of Nemaguard peach rootstock to use of peach-almond hybrid rootstocks. From 2019 to 2022, *Phytophthora* species and