

to 12.22%. The average stem rot mortality was comparatively low (16-20%) in summer crop but increased 18 to 26% in winter crop. The percentages of root and stem rot mortality in plantation of were initially low but had increased to 37.35% (summer crop) and 26% (winter crop) at Ranichauri.

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The *ex situ* Comparison of Two Improved St. John's Wort (*Hypericum perforatum* L.) Cultivars with an Iranian Wild Population

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In this research, two improved cultivars of *Hypericum perforatum* ('Gold' and 'Veperikon') were compared with a wild Iranian population (*Ardabile population*) under common garden conditions in Iran. Plants were cultivated from seed in a greenhouse and seedlings were transplanted after one month to the field plots. The statistical design of this study was a Randomized Complete Block Design with three replications. During the period of full flowering, selected phenological (number of days to flowering), morphological (plant height, mean leaf area, number of black nodules/leaf) and chemical (hypericin and pseudohypericin content) characteristics were assessed. Our observations were that the 'Veperikon' cultivar is very sensitive to soil-borne diseases. All transplanted seedlings were infected by the plant pathogenic fungus *Colletotrichum gloeosporioides* (Penz.), which caused necrosis of the whole plant. Both the 'Gold' cultivar and plants from the wild population persisted despite mild infections with *C. gloeosporioides* and produced flowering shoots at both the first and second years after cultivation. The 'Gold' cultivar was superior to the Ardabile population in terms of phenological and morphological characteristics. The average naphthodianthrone contents (% dry weight of tissue) for the wild Iranian population were 0.09(±0.03)% but for the 'Gold' cultivar, 0.65(±0.12)%. These data indicate that selection and directed cultivation of Iranian *H. perforatum* plants can result in plants with improved morphological, phenological and chemical characteristics.

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Content and Chemical Composition of Essential Oil of 'Alecrim-Pimenta' in Manaus - Amazonas State, Brazil

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Lippia sidoides Cham. is a large shrub or small tree, typical of the scrub vegetation of the Brazilian Northeast, whose leaves are rich in essential oil content reaching up to 4.5%. This oil is rich in thymol, which has antimicrobial activity against fungi and bacteria. Due to its importance, this species has been cultivated throughout Brazil. In the Amazon it has been developing well to local conditions, producing high biomass and satisfactory growth. The objective of this study was to investigate the essential oil content and its chemical constituents, cultivated under the conditions of Manaus - AM. Plants with a year old, obtained from stems, fertilized every six months with organic fertilizer (cow manure - 2 kg/m²) in the reproductive phase, were cut and taken to the Laboratory of Phytochemistry and Medicinal Plants of Embrapa Western Amazon. After separation of leaves, two samples of 20.0 g were used for determination of moisture, using an oven at 65 °C for three days. Two other samples of 100.0 g each were used for determination of essential oil. The yield of essential oil was expressed on dry weight basis. The yield was 4.36%. The major constituents of the essential oil were thymol - 76.6%, orthocymene - 6.3%, beta-caryophyllene - 5.0%, gamma-terpinene - 2.0%, myrcene - 1.1%, 4-terpineol and Timile-methyl ether, both with 1.0%. Constituents be-

low 1.0% were identified: alpha-tujeno, alpha-pinene, alpha-terpinene, limonene, 1,8-cineole, ipsdienol, umbelulone, alpha-terpineol, alpha-copaene, aromadendrene, ledeno, delta-cadinene and oxide caryophyllene. The content of essential oil and its components showed values close to that found in the conditions of natural occurrence local of the species.

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Biomass Production and Chemical Composition of Essential Oil of *Piper callosum* as Affected by Spacing in Manaus - Amazonas State, Brazil

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The family *Piperaceae* globally presents 12-14 genera and about 1400 to 1950 species, 700 species of the genus *Piper* and 600 species of genus *Peperomia*, distributed in the tropics. Brazil has five genera, and *Piper* and *Peperomia* predominate with 170 and 150 species, respectively. In general, are herbaceous plants or shrubs, with entire leaves, alternate, inflorescence with very small hermaphrodite flowers. The species of the genus *Piper* have as main characteristic, in any organs of plants, strong aroma and sweet and spicy flavor. They offer wide variety of uses as spices, flavorings and medicinal. The objective of this study was to evaluate the biomass of aerial part (dry weight basis), essential oil yield and its components, of *Piper callosum*, affected by different spacings in plants cultivated in Manaus - Amazonas States, Brazil. The experiment was conducted at Embrapa Western Amazon, in Manaus, AM, Brazil. The experimental design was randomized blocks, with four treatments (E1 - 0.5 x 0.5 m, E2 - 0.5 x 1.0 m; E3 - 1.0 x 1.0 m; E4 - 1.0 x 1.5 m) and seven replicates with six plants in useful area. The seedlings were made from cuttings of the stems and were planted in February 2007. In December of that year, they were cut at 10 cm of soil level. Biomass production was inversely proportional to the spatial arrangements, with the greatest biomass production (1,034.93 kg / ha) in the shortest spacing (E1), although no statistical difference was verified between E3 and E4. The same response was observed for the production of essential oil. For the chemical composition, regardless of spacing, it was found that the majority was composed of safole (59.1%), followed by beta-pinene (8.3%), alpha-pinene (6.5%). Other constituents found were methyl eugenol (6.3%), 1,8-cineole (4.1), sabinene (2.4%), gamma-terpinene and elemicine, both with 2.0% and beta-caryophyllene (1.2%).

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The Intercropping Fennel and Bean in Brazilian Semi-Arid Region

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Fennel (*Foeniculum vulgare* Mill.) is a spice and medicinal plant from Mediterranean region. In the Brazilian northeast, this crop is grown by family farmers, without irrigation, under high temperature conditions. A field experiment was conducted in semi-arid of Sergipe state, Brazil, to evaluate the performance of fennel - bean intercropping, under organic management, regarding to the agronomic traits, Area Equivalency Index (AEI) and components of yield. The experiment was conducted in a complete randomized blocks design with six replications and four treatments. The treatments were single crop and intercropping (additive model) of fennel with one variety of cowpea (*Vigna unguiculata*) and two varieties of beans (*Phaseolus vulgaris*), under organic management. Additionally, cowpea and beans were also grown as single crops. Plants of fennel were obtained from seeds sowing in trays, filled with organic substrate. The field