



## Silicon exerts additive effects on phosphorus acquisition by potato intercropped with chickpea

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**Abstract:** The role played by silicon (Si) and legume intercropping in nutrient acquisition by potato crop has been neglected in most studies. A field trial integrating potato (*Solanum tuberosum* L.) with chickpea (*Cicer arietinum* L.) in intercropping system was conducted over six (6) growing seasons in the upper midland (1552 m above sea level) agro-ecological zone of Kenya. The intercropped chickpea secreted enzyme phosphatase into the rhizosphere (5.1–27.1 mol g<sup>-1</sup> fwt h<sup>-1</sup>) thus mobilizing organic (4.2–18.9 mg kg<sup>-1</sup> soil) and inorganic phosphorus (6.9–42.8 mg kg<sup>-1</sup> soil). This increased phosphorus availability and acquisition by the intercropped potato. Chickpea took up more cations than anions, resulting in net proton efflux (43–105 mmol kg soil<sup>-1</sup>) with a significant decrease in rhizosphere pH. This acidic medium enhanced Si solubilization, increasing Si<sup>+</sup> ions, which competed with Fe<sup>3+</sup> and Al<sup>3+</sup> ions for specific soil phosphorus sorption sites. Provision of sustainable seed supply systems for chickpea and market linkages for water-soluble silicon are necessary for adoption of this innovation.

**Keywords:** Chickpea; carboxylate acid; enzyme phosphatase; intercropping; silicon.

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