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## Rapid Early Growth Outranks Weed Competition in Horticultural Systems in Semi-Arid Bolivia

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### Abstract

Onion (*Allium cepa*) is an important crop in Bolivia, particularly in the semi-arid region of Cochabamba. Here, water availability, as well as nitrogen (N), limit growth. We hypothesised that using locally available mulch might increase growth and yield more than the equivalent N in the form of urea as nutrient release may be better synchronised with crop demand. Mulch may also suppress weeds, thus improving relative yield.

We tested three mulches *Dodonaea viscosa*, *Melinis repens*, *Chamaecytus proliferus* (4 t DM ha<sup>-1</sup>, equivalent to 44, 26 and 39 kg N ha<sup>-1</sup>) versus two urea treatments (40 and 80 kg N ha<sup>-1</sup>) in an onion monoculture, planted in January 2019. We also included an unfertilised, unmulched control and used a randomised complete block design (n=4). Growth parameters (plant height, circumference, number of green and of newly produced leaves) were evaluated every two weeks, weeded at 8 weeks after planting (WAP) and harvested at 19 WAP.

In the two urea treatments, onions grew faster with maximum circumference obtained by 8 WAP, and plants were significantly taller with more green leaves than all other treatments, despite having significantly higher weed biomass. Growth of onions in mulch treatments was not different from the control. At harvest, mulching treatments had higher aboveground biomass compared with the control and with the urea treatments. The urea-80 treatment had significantly higher onion yield than all other treatments. *Melinis repens* (26 kg N ha<sup>-1</sup>) was the best-performing mulch treatment, with yields not different from the urea-40 treatment and the number of harvested onion bulbs being higher than the urea-80 treatment.

We conclude that yields were N-limited. There was no evidence of better nutrient synchrony with mulches; on the contrary, rapid early growth promoted later biomass allocation below ground and thus higher onion yield, so fertiliser can be recommended. Weed competition did not play an important role. Where farmers have limited purchasing power, the best-bet mulch was *Melinis repens*.

**Keywords:** *Allium cepa*, horticulture, mulch, nitrogen efficiency, semi-arid