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Mixed Planting with Legumes Modified the Water Source and Water Use of Pearl Millet

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Abstract: In semi-arid areas, pearl millet is an important staple food crop that is traditionally intercropped with cowpea. This study evaluated the water competition between pearl millet and cowpea using deuterated water. At vegetative stage, pearl millet biomass production was lower in the pearl millet-cowpea (PM-CP) combination than in the pearl millet-pigeon pea (PM-PP) and pearl millet-bambara nut (PM-BN) combinations. PM-CP used more water than PM-PP and PM-BN under well-watered conditions; however, all combinations used similar amounts of water under dry conditions. The biomass production, photosynthetic rates, transpiration rates, and midday leaf water potential of pearl millet at early flowering stage were not significantly reduced by mixed planting with cowpea sown two weeks later as compared with single planted pearl millet. When pearl millet and cowpea were sown at the same time, mix planting significantly increased the recovery rates of recently irrigated heavy water in pearl millet, but not in cowpea in both vegetative and early flowering stages. Midday leaf water potential and transpiration rates in pearl millet were lowered by mixed planting but those in cowpea were not. These indicate that the water source of pearl millet is shifted to the recently irrigated and easily accessible water. By contrast, when cowpea was sown two weeks later than pearl millet, this trend was not observed. These results provide new evidence on water competition in the PM-CP intercropping system; cowpea has higher ability to acquire existing soil water than pearl millet when both crops are sown at the same time.

Keywords: [Competition](#), [Deuterium](#), [Drought](#), [Heavy water](#), [Intercropping](#), [Leaf water potential](#), [Photosynthesis](#), [Stable isotope](#)

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