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THE BARLEY MUTANT HAPPY UNDER THE SUN 1 (HUS1): A FURTHER STEP TOWARDS A NEW GENERATION OF PALE GREEN CROPS

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Reduced antenna size of photosystems and lower leaf chlorophyll content has been shown to increase photosynthetic efficiency and biomass accumulation in microalgae, cyanobacteria and higher plants grown under high-density cultivation conditions. Here, we have asked whether this strategy is also applicable to a major crop by characterising the barley *mutant happy under the sun 1* (*hus1*). The pale green phenotype of *hus1* is due to a 50% reduction in the chlorophyll content of leaves, owing to a premature stop codon in the *HvcpSRP43* gene for the 43-kDa chloroplast Signal Recognition Particle (cpSRP43). The *Hv*cpSRP43 protein is responsible for the uploading of photosystem antenna proteins into the thylakoid membranes, and its truncation results in a marked reduction in photosystem antenna size. Besides a detailed molecular and physiological characterization of the mutant grown under controlled greenhouse conditions, we show that the agronomic performance of *hus1* plants, in terms of total biomass production and grain yield under standard field conditions, is comparable to that of control plants. The results are discussed in terms of the potential benefits of the *hus1* phenotype, and of natural allelic variants of the *HvcpSRP43 locus*, with respect to the productivity and mitigation of climate change.