Potato (Solanum tuberosum) is the third most important crop in terms of human consumption. Hence understanding regulatory mechanisms controlling tuber initiation is significant not only from a theoretical but also practical point of view. Tuberization of S. tuberosum is a complex morphogenic process regulated by both, environmental conditions and inner plant status. Environmental conditions regulating the onset of tuberization have been known for a long time, but the molecular basis of tuber initiation has only recently been discovered, in particular using wild subspecies S. tuberosum subsp. andigena. BELL transcription factors are among the important components of the regulatory signalling network. The aim of this study was to modulate balance between the BELL transcription factors that induce and repress tuberization towards strengthening of tuber induction using two cultivars of Solanum tuberosum subsp. tuberosum, cv. Kamýk, resp. cv. Korela. To achieve this, transgenic lines carrying construct containing a part of coding sequence StBEL11, resp. StBEL29 in antisense orientation (AS) under control of constitutive promoters and lines carrying complete sequences of StBEL5 and StPTB6 genes under control of their native promoters were derived. We used the StBEL11 and StBEL29 AS constructs with the aim to decrease via RNA interference the levels of StBEL11, resp. StBEL29 that act as tuberization repressors. Transformation by StBEL5 + StPTB6 construct should result in a moderate increase in StBEL5 and StPTB6 levels. The decrease in StBEl11 transcript was confirmed in the leaves of two independent transgenic lines of S. t. tuberosum cv. Kamýk carrying StBEL11 AS construct. These transgenic lines formed tubers earlier, and tended to increased tuber number and yields. Furthermore, the levels of selected transcripts related to tuberization were determined in these transgenic lines. Transcript level of the BELL interaction partner StPOTH1 in mutants did not differ from control. Transcript level of key component of the mobile tuberigenic signal StSP6A in the leaves did not change significantly in the preliminary experiment, the level of the StBEL5 transcript was only slightly reduced. The results obtained for the BEL11 AS mutants, although preliminary, suggest that the initial hypothesis of the possibility to enhance potato tuberization by modulation of BELL transcription factors balance might be valid.