

HIGH LEVELS OF ANTHOCYANINS IN POTATO REDUCE SUSCEPTIBILITY TO RHIZOCTONIA SOLANI INFECTION

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Solanum tuberosum, black scurf, antifungal compounds, plant protection

The prevalence of plant diseases is exacerbated by the changing environmental conditions and finding sustainable solutions is becoming paramount. The modulation of anthocyanins in plant tissues can play a versatile role in mitigating the effects of stress conditions during abiotic stress as well as during pathogen infections. Regarding pathogen infection, *in vitro* studies have shown that anthocyanins reduce necrosis damage caused by necrotrophic fungi. Nevertheless, less focus has been placed on *in vivo* plant immune response in the presence of anthocyanin pigmentation. The purpose of this study was to determine whether anthocyanins may improve potato tolerance to *Rhizoctonia solani* infection, an economically damaging disease of potato. Transcriptomic analysis was carried out to pinpoint the molecular mechanism underlying the resistance mediated by anthocyanins against *Rhizoctonia* by using potato cultivars contrasting in anthocyanin content and, accordingly, with different tolerance to the fungus infection. Results showed that the sensitive Musica (showing acyanic vegetative tissues) had a severe transcriptomic perturbation, indicated by a large number of differently regulated genes (DEGs). A fewer number of DEGs were observed in the transcriptome of anthocyanin-pigmented Blue Star and most of them encoded for proteins involved in specific response to fungus attack. It is possible to hypothesize that the high concentration of natural antioxidants in potatoes

operates as a first-line defence against necrotic attack modulating the immune response. To confirm these data, we are studying the molecular response to necrotrophic fungi in a heterologous system (tobacco) which transgenically over-accumulates anthocyanins. Preliminary results indicated that the presence of anthocyanins reduced the necrosis diameter on the purple leaves compared to acyanic leaves of wild-type plants. Virus-induced gene silencing (VIGS) approach verified that the reduction of pigmentation resulted in a loss of tolerance. In conclusion, our data suggested the role of anthocyanins in increasing the tolerance of potato to *Rhizoctonia*. By modulating the immune response of potato, as indicated by a specialized transcriptomic response, anthocyanins exert their protective role in parallel to direct antioxidant activity. On the basis of this hypothesis, studies on candidate genes involved in the alteration of immune response by anthocyanins are continuing and will be investigated with functional analyses.