

**Title** *Kloeckera apiculata* strain 34-9 preparation for biocontrol of postharvest decay of citrus and possible mode of action

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### Abstract

*Citrus unshiu* “Gouqing 1” was used as material for elucidating the effect of *Kloeckera apiculata* strain 34-9 suspension postharvest treatment on preventing fruit decay during storage period. The result showed that *K. apiculata* strain 34-9 preparation of  $2 \times 10^6$  CFU/ml (CFU, cloning forming unit) significantly reduced the natural development of decay following storage at 5°C for 100 d, and the application of isolate 34-9 resulted in low average decay incidence in citrus fruit 0.77%, compared with 11.43% in the untreated control citrus fruit. The yeast antagonist had no significant effect on firmness, total soluble solids, ascorbic acid or titratable acidity after three month storage at 5°C. The populations of *K. apiculata* strain 34-9 on the surface of the citrus fruits varied remarkably with different treatments. At the beginning of the experiment (time 0 h), the yeast population was  $2 \times 10^6$  CFU/ml. per citrus fruit with yeast cell suspension treatment, and increased to  $1.7 \times 10^7$  CFU/ml in citrus during the period of 0-40 d storage, then stabilized thereafter ( $3.5 \times 10^5$  CFU/ml to  $7 \times 10^5$  CFU/ml per citrus). In addition, the yeast population of both carbendazim treatment and control was less than that of yeast cell suspension treatment during storage. During storage, the change of relative electrical conductivity (REC) showed a coordinate tendency with malondialdehyde (MDA) content, which kept continuously growing from the beginning to the end of the storage. In the storage period of 25 d, the REC value and MDA content of the treatments were all significantly lower than those of water treatment, but had no obvious difference from those of carbendazim treatment. *K. apiculata* strain 34-9 had no effect on the enzyme activity of super oxide dismutase (SOD), but significantly improved peroxidase (POD) activity after 100 d storage. After storage at 5°C for 100 d, *K. apiculata* strain 34-9 did not alter any quality parameters of citrus fruit. Observation under light microscopy and scanning electron microscopy revealed attachment of *K. apiculata* strain 34-9 to the *P. italicum* hyphae. We suggest that the high antagonistic activity of *K. apiculata* strain 34-9 against citrus blue mold may be related to its capability to compete with *P. italicum*, for space and nutrients and /or involvement of directly antagonist of the yeast on the fungus.