

Effects of commercial natural compounds on postharvest decay of strawberry fruit

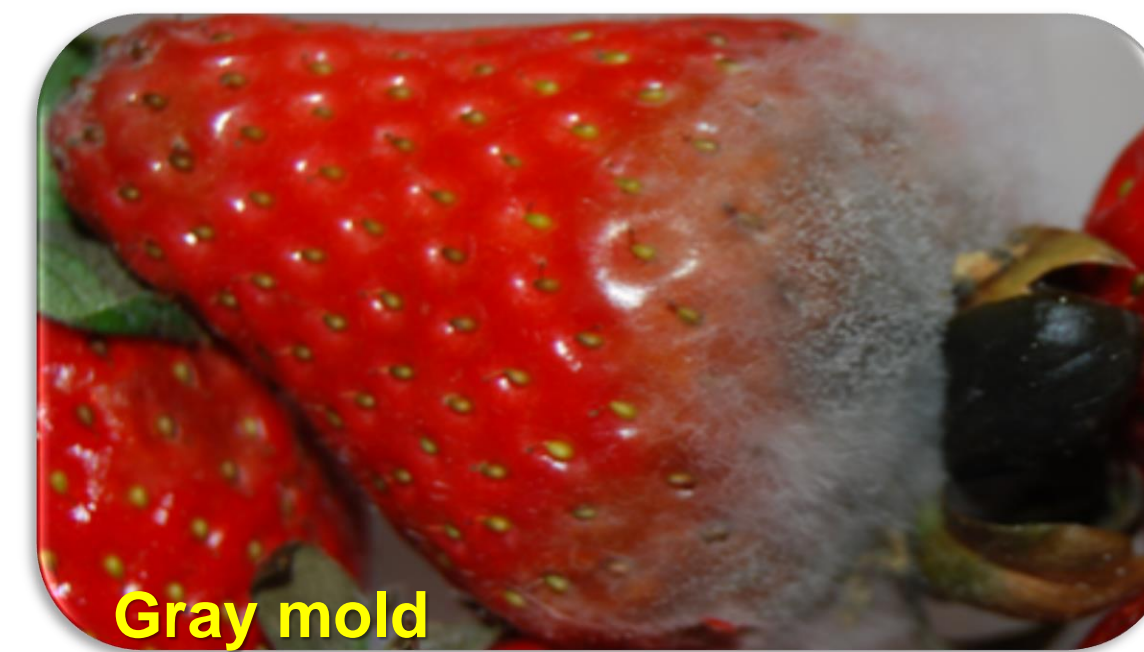
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Gray mold and Rhizopus rot, which is caused by *Botrytis cinerea* and *Rhizopus stolonifer*, respectively, are the most destructive forms of postharvest decay of the strawberry fruit.



The objective of this study was to verify the effectiveness of a list of promising commercial compounds (listed in Table) based on chitosan, essential oils EOs, organic compounds, and plant growth regulator on the control of the postharvest decay of strawberries kept at either room temperature or cold stored and then exposed to shelf life.

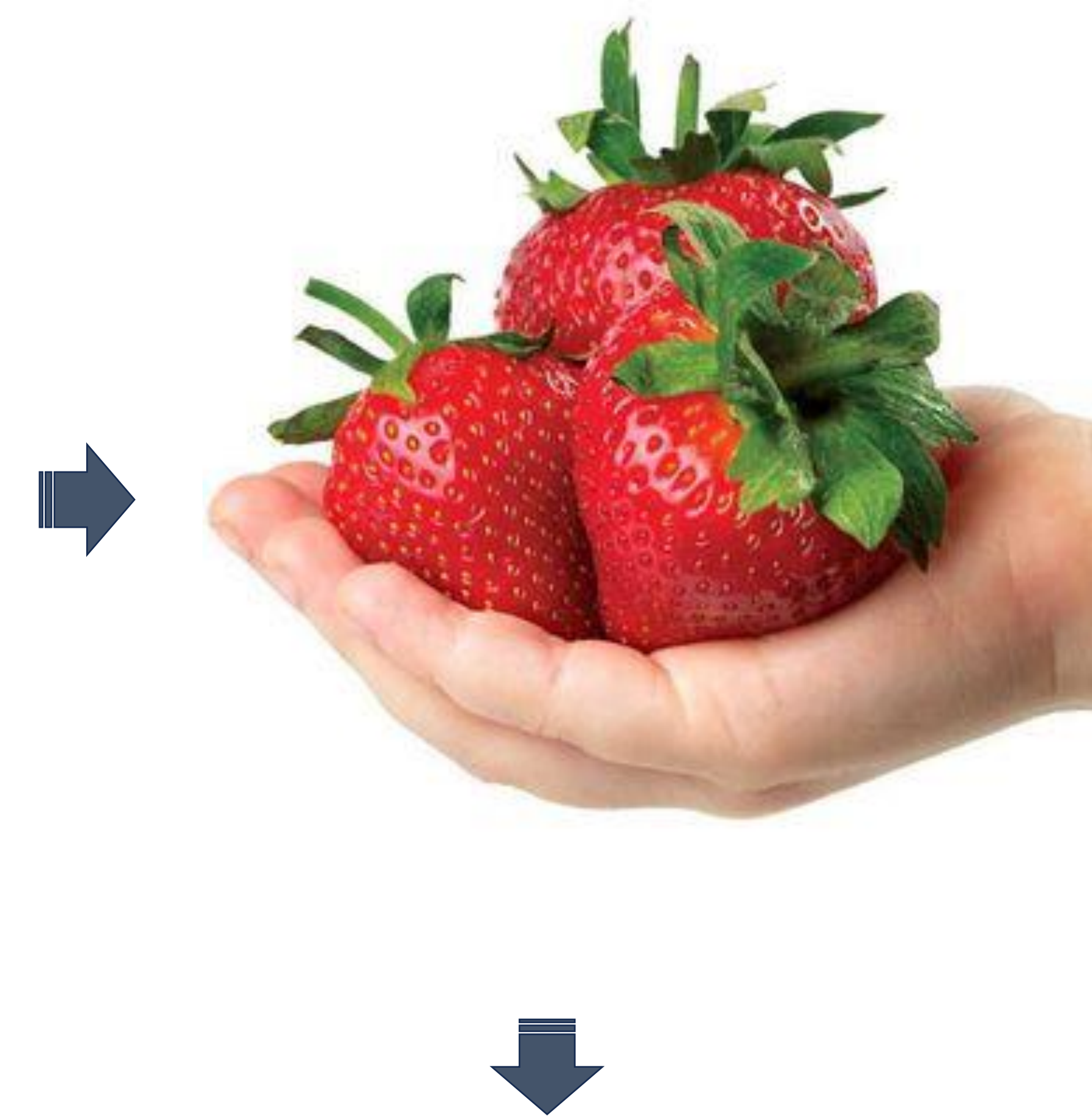


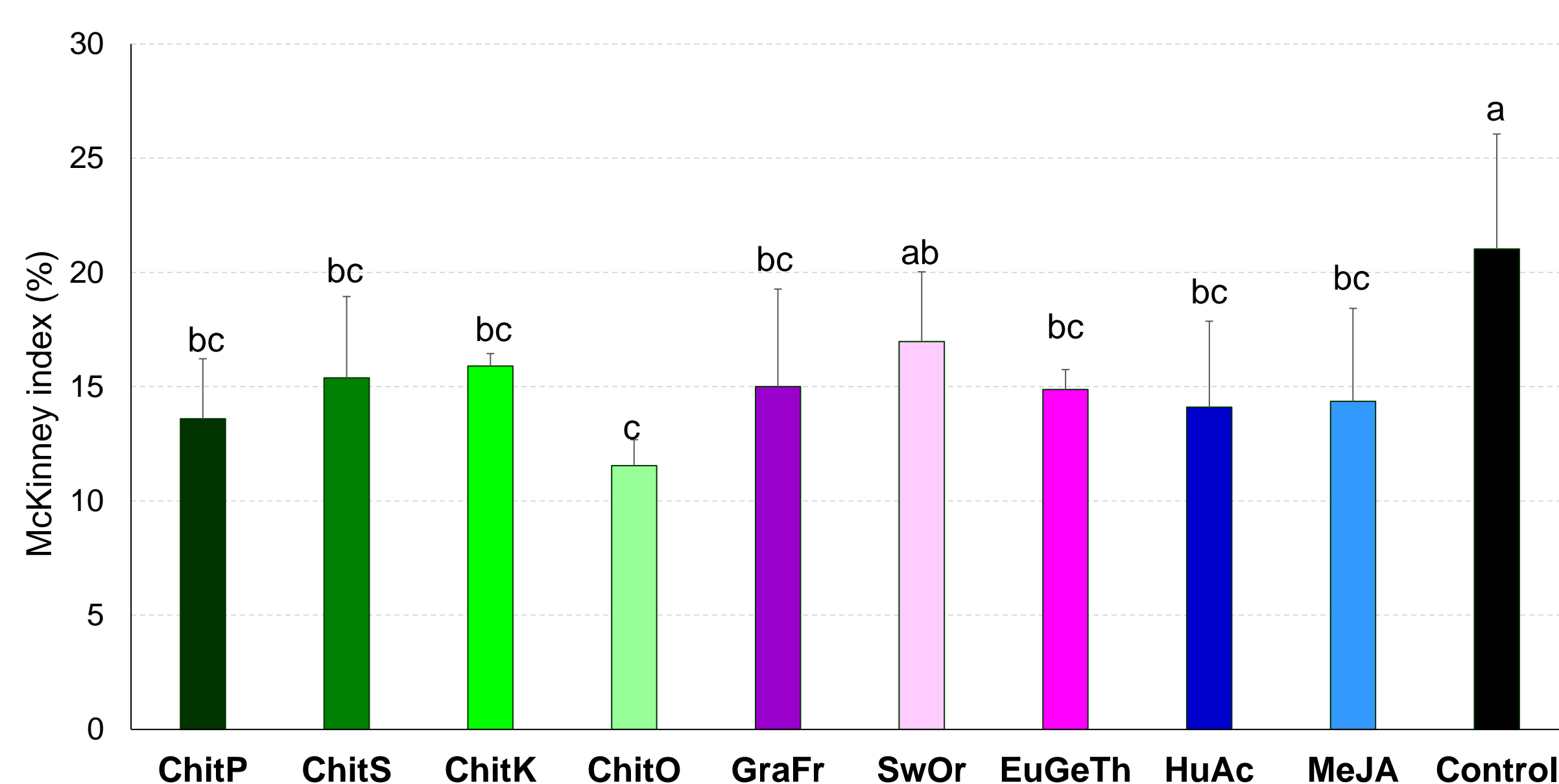
Table. Commercial names and sources of the formulations containing the active ingredients used in the postharvest treatments of strawberries

Name	Formulation commercial name	Source (country)	Active ingredient	Application dose (v/v); *(w/v)
'ChitP'	Chito Plant powder	ChiPro GmbH; Bremen, (Germany)	Chitosan	1%
'ChitS'	Chito Plant Solution	ChiPro GmbH; Bremen, (Germany)	Chitosan	1%
'ChitO'	OIL-YS	Venture Chemicals, Inc. (Lafayette, LA, United States)	Chitosan	1%
'ChitK'	Kaitosol	Advanced Green Nanotechnologies Sdn Bhd; (Cambridge, UK)	Chitosan	1%
'GraFr'	DF-100 Forte	Agritalia, (Rovigo, Italy)	Grapefruit seed extract	0.5%
'SwOr'	Prev-Am plus	Nufram, (Milano, Italy)	Sweet orange extract	0.5%
'EuGeTh'	3Logy	Sipcam, (Milano, Italy)	Eugenol, geraniol, and thymol extracts	0.4%
'HuAc'	Humic acid	Sigma-Aldrich, (USA)	Humic acid sodium salt	0.5% *
'MeJA'	Methyl jasmonate	Sigma-Aldrich, (USA)	Methyl jasmonate	1%

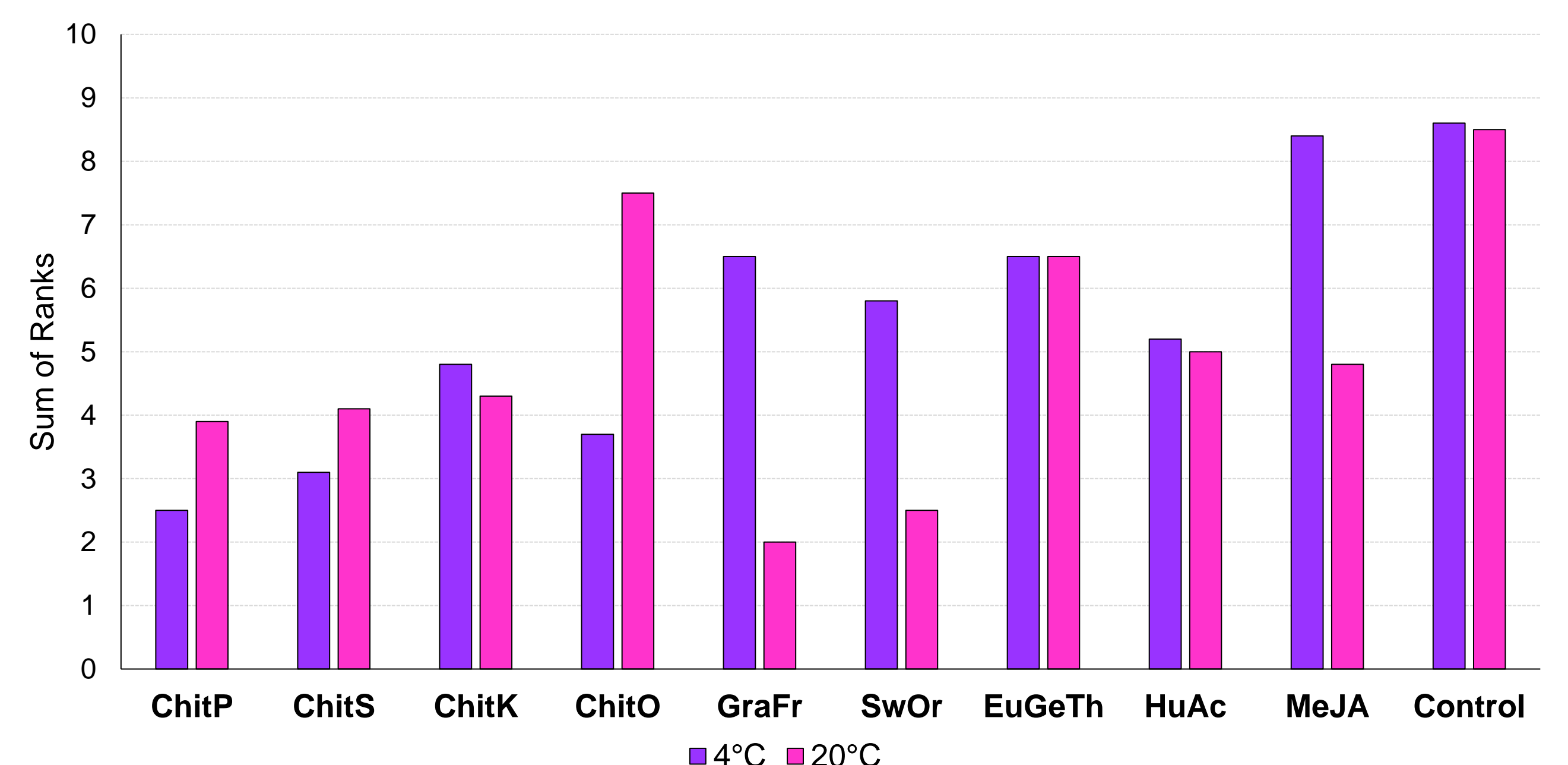
Strawberries were dipped in solution for 30 s and incubated at room temperature ($20 \pm 0.5 \text{ }^\circ\text{C}$) or at cold storage conditions ($4 \pm 0.5 \text{ }^\circ\text{C}$) following 4 days of shelf life at $20 \text{ }^\circ\text{C}$.

The McKinney index of decay was significantly decreased compared to the control: the compounds based on chitosan, 'ChitP', 'ChitS', 'ChitK', and 'ChitO', had decreases of 35.36%, 26.82%, 24.39, and 45.12%, respectively, whilst the compounds based on EOs, 'GraFr', and 'EuGeTh', had decreases of 28.65% and 29.26%, respectively, and finally, those with 'MeJA' and 'HuAc' had decreases of 31.7% and 32.92%, respectively.

'ChitP', 'ChitS', and 'ChitO' were more effective at controlling postharvest disease in strawberries in cold storage conditions (sum of ranks 2.2, 3.1, and 5.2, respectively) compared to room temperature storage (sum of ranks 3.9, 4.1, and 7.5, respectively); while the 'MeJA', 'SwOr', and 'GraFr' were more effective at room temperature conditions (4.8, 2.5, and 2, respectively) compared to cold storage ones (8.4, 5.8, and 6.5, respectively).



McKinney's index of gray mold of the 'Monterey' strawberry fruit. Strawberries were treated after harvest, stored for 7 days at $4 \pm 0.5 \text{ }^\circ\text{C}$, and then exposed to 4 days of shelf life at $20 \pm 1 \text{ }^\circ\text{C}$ and 95% to 98% relative humidity. Values with different small letters are different at $p < 0.05$.



Effect of postharvest treatment with natural compounds on the reduction of gray mold on strawberries according to rank analysis. The fruit was kept at $4 \text{ }^\circ\text{C}$ and $20 \pm 1 \text{ }^\circ\text{C}$, 95%–98% RH.

The tested natural compounds were effective at both cold storage and room temperature at containing the postharvest decay of strawberries, and they had a variable action according to the storage conditions. However, our work was run with the immersion of the strawberry fruit, and to progress to practical application, will be necessary.

