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1 **The effect of treatment with the combined static magnetic field and cold water shock on the**
2 **physicochemical properties of cucumbers**

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8 **Abstract:** Based on the mechanism of temperature shock treatment and electromagnetic effect for food
9 preservation, this paper developed a novel food preservation method by combining static magnetic field with
10 low magnetic flux density and low-temperature water shock to process the fresh postharvest vegetable.
11 Compared with the single cold-water shock treatment (CST, $T_w = 2\text{ }^\circ\text{C}$, $\tau = 40\text{ min}$), the static magnetic field
12 and cold-water shock treatment (SMCT, $B = 70\text{ Gs}$, $T_w = 2\text{ }^\circ\text{C}$, $\tau = 40\text{ min}$) caused an increase of cooling-rate
13 of cucumbers' tissues during treatment. Weight loss of SMCT was also lower than that of CST during
14 storage. Furthermore, decay incidence and color difference of SMCT were about 40.2% and 10.6% lower
15 than that of CST. Activities of catalase and superoxide dismutase for SMCT were higher than that of CST,
16 which caused a reduction of malondialdehyde. Experimental results confirmed that SMCT had a positive
17 influence on pre-cooling, preservation quality and physicochemical properties of cucumbers.

18 **Abbreviations**

19 T_w , temperature of water; B , magnetic flux density; τ , time of treatment; CK, control group; CST, cold-water
20 shock treatment ($T_w = 2\text{ }^\circ\text{C}$, $\tau = 40\text{ min}$); SMCT, the combined treatment of static magnetic field and
21 cold-water shock ($B = 70\text{ Gs}$, $T_w = 2\text{ }^\circ\text{C}$, $\tau = 40\text{ min}$); CO_2 , Carbon dioxide; CAT, catalase; SOD, superoxide
22 dismutase; MDA, malondialdehyde; TCA, trichloroacetic acid; TBA, 4,6-Dihydroxy-2-mercaptopyrimidine;
23 DTT, DL-Dithiothreitol; PVP, polyvinyl pyrrolidone; RSM, response surface methodology; CCD, central
24 composite design.

25 **Chemical compounds studied in this article**

26 Carbon dioxide (PubChem CID: 280); malondialdehyde (PubChem CID: 10964); catalase (PubChem SID:
27 48422034); superoxide dismutase (PubChem SID: 160693077).

28 **Keywords:** Static magnetic field; Cold-water shock treatment; Heat and mass transfer; Preservation quality;
29 Enzyme activity

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