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Second-order perturbation analysis of low-amplitude traveling waves  
in a periodic chain with quadratic and cubic nonlinearity

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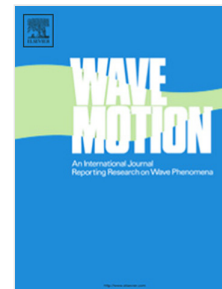
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**Research highlights**

- A second-order perturbation analysis of single-wave propagation in a periodic nonlinear chain is presented using both discrete and continuum analysis.
- While the first-order multiple scales captures the cubic effect alone, the second-order analysis uncovers the quadratic effect.
- The quadratic nonlinearity shows to affect the wave propagation velocities and phases.

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