Fig. 8. Variation of R_1 with F_1 for $\lambda < 0$.

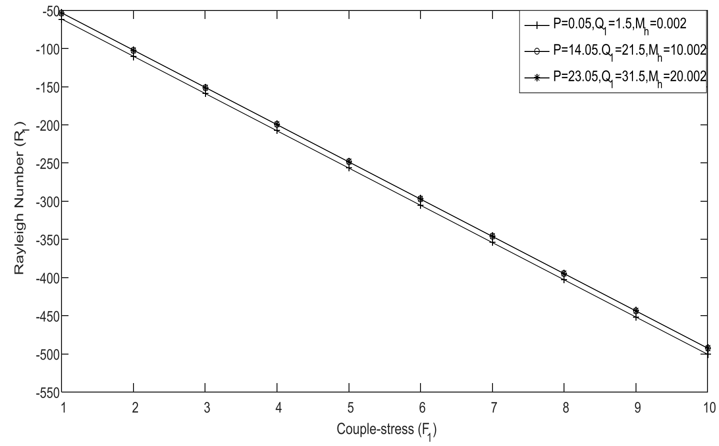

Fig. 9. Variation of R_1 with F_1 for $\lambda < 0$.

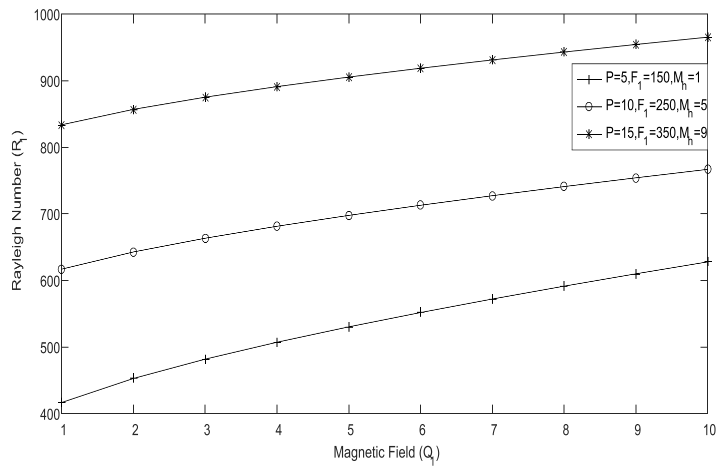

Fig. 10. Variation of R_1 with Q_1 for $\lambda > 0$.

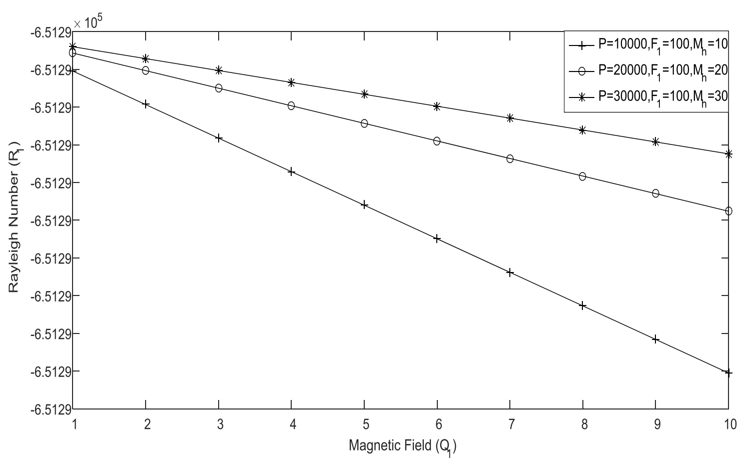

Fig. 11. Variation of R_1 with Q_1 for $\lambda < 0$.

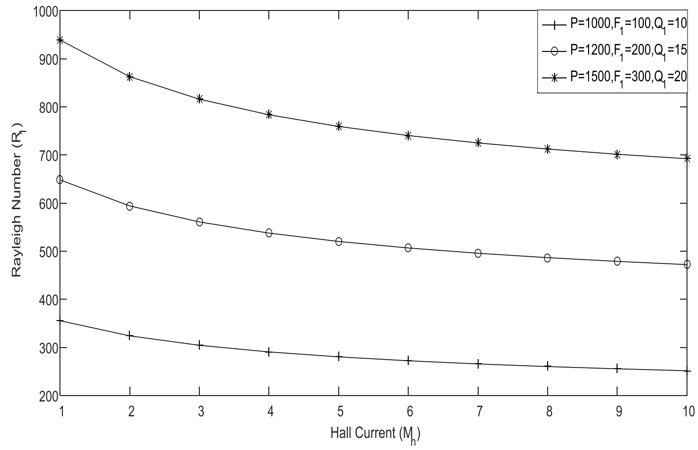

Fig. 12. Variation of R_1 with M_h for $\lambda > 0$.

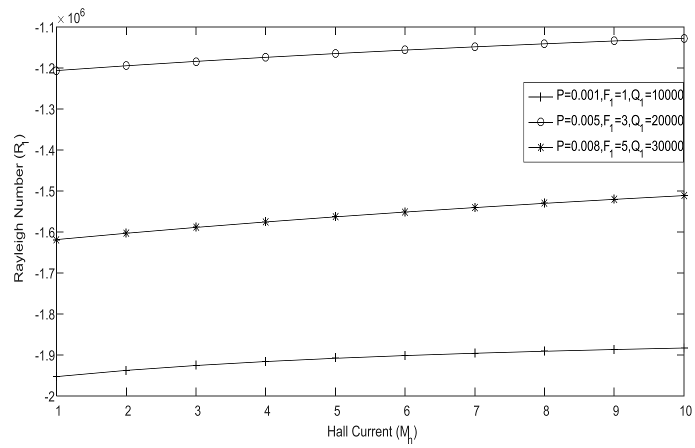

Fig. 13. Variation of R_1 with M_h for $\lambda < 0$.

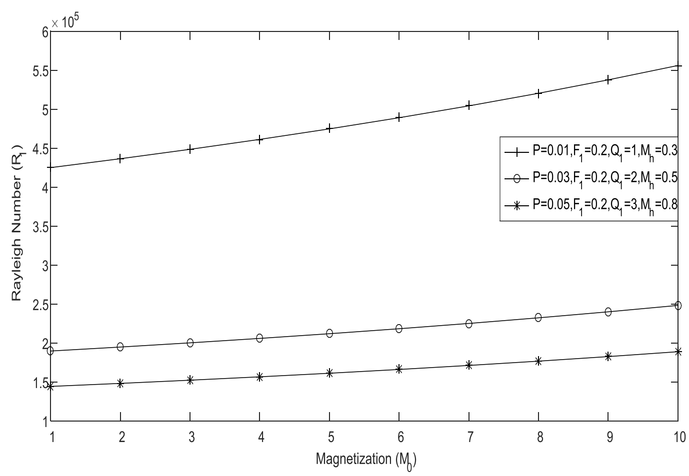

Fig. 14. Variation of R_1 with M_0 for $\lambda > 0$.

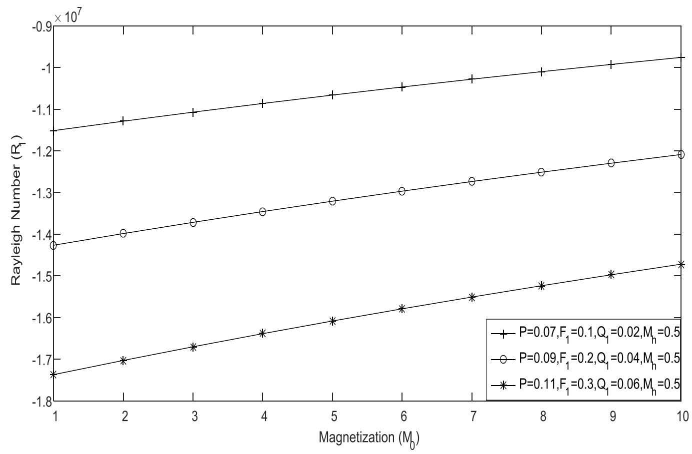

Fig. 15. Variation of R_1 with M_0 for $\lambda < 0$.

In fig. 2, critical Rayleigh number R_1 increases with increase in medium permeability parameter P for $\lambda = 50$, which indicates that medium permeability has a stabilizing effect on the system. In fig. 3, critical Rayleigh number R_1 decreases with increase in medium permeability parameter P for $\lambda = 2$, which indicates that medium permeability has a destabilizing effect on the system. In fig. 4, critical Rayleigh number R_1 increases with increase in medium permeability parameter P for $\lambda = -5$, which indicates that medium permeability has a stabilizing effect on the system. In fig. 5, critical Rayleigh number R_1 decreases with increase in medium permeability parameter P for $\lambda = -0.00001$, which indicates that medium permeability has a destabilizing effect on the system.
In fig. 6, critical Rayleigh number R_1 increases with increase in couple-stress parameter F_1 for $\lambda = 5$, which indicates that couple-stress has a stabilizing effect on the system. In fig. 7, critical Rayleigh number R_1 decreases with increase in couple-stress parameter F_1 for $\lambda = 50$, which indicates that couple-stress has a destabilizing effect on the system. In fig. 8, critical Rayleigh number R_1 increases with increase in couple-stress parameter F_1 for $\lambda = -10000$, which indicates that couple-stress has a stabilizing effect on the system. In fig. 9, critical Rayleigh number R_1 decreases with increase in couple-stress parameter F_1 for $\lambda = -2000$, which indicates that couple-stress has a destabilizing effect on the system.
In fig. 10, critical Rayleigh number R_1 increases with increase in magnetic field parameter Q_1 for $\lambda = 3$, which indicates that magnetic field has a stabilizing effect on the system. In fig. 11, critical Rayleigh number R_1 decreases with increase in magnetic field parameter Q_1 for $\lambda = -15$, which indicates that magnetic field has a destabilizing effect on the system.
In fig. 12, critical Rayleigh number R_1 decreases with increase in hall current parameter M_h for $\lambda = 4$, which indicates that magnetic field has a destabilizing effect on the system. In fig. 13,

critical Rayleigh number R_1 increases with increase in hall current parameter M_h for $\lambda = -0.5$, which indicates that magnetic field has a stabilizing effect on the system.

In fig. 14, critical Rayleigh number R_1 increases with increase in magnetization parameter M_0 for $\lambda = 0.2$, which indicates that magnetic field has a stabilizing effect on the system. In fig. 15, critical Rayleigh number R_1 increases with increase in magnetization parameter M_0 for $\lambda = -0.25$, which indicates that magnetic field has a stabilizing effect on the system.

Conclusions

In the present paper, we are discussing about the effect of hall current on thermal stability of couple-stress ferromagnetic fluid in the presence of variable gravity field and horizontal magnetic field saturating in a porous medium. A linearized theory and normal mode technique are used to attain the dispersion relation. The main results from the evaluation of the present paper are as below:

1. Medium permeability has both stabilizing and destabilizing effect on the system for $\lambda > 0$ and $\lambda < 0$ under certain conditions. Furthermore, in the absence of magnetic field, medium permeability has a stabilizing effect on the system for $\lambda < 0$ and destabilizing effect for $\lambda > 0$.
2. Couple-stress has both stabilizing and destabilizing effect on the system for $\lambda > 0$ and $\lambda < 0$ under certain conditions. Furthermore, in the absence of magnetic field, couple-stress has a stabilizing effect on the system for $\lambda > 0$ and destabilizing effect for $\lambda < 0$.
3. Magnetic field has a stabilizing effect on the system for $\lambda > 0$ and destabilizing effect for $\lambda < 0$.
4. Hall current has a stabilizing effect on the system for $\lambda < 0$ and destabilizing effect for $\lambda > 0$.
5. Magnetization has a stabilizing effect on the system for both $\lambda > 0$ and $\lambda < 0$.
6. The principle of exchange of stabilities is not valid for the present problem under consideration, whereas in the absence of magnetic field (hence hall current), it is valid for the present problem if $\lambda g_0 \geq \dfrac{\gamma M_0 \nabla H}{\rho_0 \alpha}$.

Acknowledgment

The corresponding author acknowledges CSIR, New Delhi for providing financial assistance through JRF Vide letter No. 08/688(0001)/2018-EMR-I.

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