Fig. 16: Effect of Soret number S_r on the fluid concentration when $P_r = 0.71, S_c = 0.22, R = 1.0, \ Q_H = 0.5, k_r = 0.5$ at $t = 1.0$.
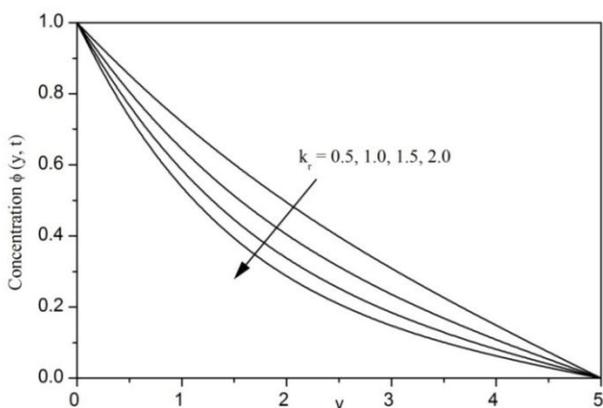

Fig. 17: Effect of chemical reaction rate k_r on the fluid concentration when $P_r = 0.71, S_c = 0.22, R = 1.0, \ Q_H = 0.5, S_r = 1.0$ at $t = 1.0$.

Table 1: Effects $P_r, Q_H, S_c, k_r, M, R, S_r, K, \Omega, G_r$ and G_m on the skin-friction (τ).

P_r	Q_H	R	S_c	k_r	S_r	M	K	Ω	G_r	G_m	τ
0.71	0.5	1.0	0.22	0.5	1.0	2.0	1.0	1.0	2.0	2.0	0.244350
7.00	0.5	1.0	0.22	0.5	1.0	2.0	1.0	1.0	2.0	2.0	0.339542
0.71	1.0	1.0	0.22	0.5	1.0	2.0	1.0	1.0	2.0	2.0	0.260392
0.71	0.5	1.5	0.22	0.5	1.0	2.0	1.0	1.0	2.0	2.0	0.237580
0.71	0.5	1.0	0.60	0.5	1.0	2.0	1.0	1.0	2.0	2.0	0.273632
0.71	0.5	1.0	0.22	1.0	1.0	2.0	1.0	1.0	2.0	2.0	0.262128
0.71	0.5	1.0	0.22	0.5	2.5	2.0	1.0	1.0	2.0	2.0	0.230256
0.71	0.5	1.0	0.22	0.5	1.0	2.5	1.0	1.0	2.0	2.0	0.511804
0.71	0.5	1.0	0.22	0.5	1.0	2.0	2.0	1.0	2.0	2.0	0.168454
0.71	0.5	1.0	0.22	0.5	1.0	2.0	1.0	1.5	2.0	2.0	0.142322
0.71	0.5	1.0	0.22	0.5	1.0	2.0	1.0	1.0	4.0	2.0	0.050864
0.71	0.5	1.0	0.22	0.5	1.0	2.0	1.0	1.0	2.0	4.0	0.088760

CONCLUSIONS

In this paper, the effects of radiation and thermal diffusion on unsteady hydro-magnetic natural convection heat and mass transfer flow of a rotating and chemically reacting fluid past an infinite vertical porous flat plate in the presence heat sink is provided. The dimensionless governing partial differential equations have been solved numerically by using the Ritz finite element method. The significant findings of the study are summarized as follows:

1. Magnetic parameter, Prandtl number, heat absorption parameter, Schmidt number and chemical reaction rate tends to decrease the fluid velocity in the boundary layer.

2. Radiation parameter, permeability parameter, rotation parameter, Soret number, thermal Grashof number and mass Grashof number tends to increase the fluid velocity in the boundary layer.

3. Heat absorption parameter and Prandtl number tends to decrease the fluid temperaturewhereas radiation parameter tends to increase the fluid temperature.

4. Schmidt number and chemical reaction rate tends to decrease the fluid concentration whereas Soret number tends to increase the fluid concentration.

5. The effect of the above stated physical parameters on the skin-friction shows quite the opposite effect to that of the fluid velocity.

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