i. **Studies on mode of action of fungicides and refinement of spray schedule against premature leaf fall of apple in Shimla District of Himachal Pradesh**

**Summary**

Fifteen different fungicides, viz. mancozeb, captan, dodine, copper oxychloride, metiram, benomyl, carbendazim, thiophanate methyl, shield, Kresoxim methyl, azoxystrobin, pyraclostrobin, hexaconazole, difenoconazole and tebuconazole were evaluated at different concentrations for their physical mode of action. Whereas, nine fungicides, viz. mancozeb, kresoxim methyl, carbendazim, difenoconazole, metiram, thiophanate methyl, dodine, shield and pyraclostrobin+metiram were selected for such study in the field. Dithiocarbamate fungicides provided maximum control of Marssonina blotch disease with more effect on conidial production, germinability and viability after their protective applications on apple plants both under semi-controlled as well as under field conditions. Mancozeb formulations also showed maximum retention activity as compared to other fungicides, and, registered maximum control of the disease. Strobilurin fungicides showed the strongest curative, pre-symptom and post-symptom activity against Marssonina blotch in semi-controlled as well as under field conditions. These fungicides showed inhibitory effect on conidial production, germinability and number of viable conidia as compared to other test fungicides. On the basis of prophylactic rating, dithiocarbamate fungicides were most effective protectants against Marssonina blotch of apple. The after-infection, pre-symptom and post-symptom activity of strobilurins, benzimidazoles and triazoles exceeded that of their protective activity. Strobilurin fungicides were rated best (with 1-3 rating) followed by the benzimidazoles in this respect. In field, pyraclostrobin+metiram attained the highest rating (1) followed by kresoxim methyl, carbendazim, thiophanate methyl, dodine, difenoconazole, mancozeb, shield and metiram. Among six spray schedules evaluated in field, spray schedule-II (comprising of mancozeb (0.3%) at walnut stage, carbendazim (0.05%) at 20 days after 1st spray and mancozeb flowable (0.3%) at 40 days after 2nd spray) was found best to control Marssonina blotch of apple, of course along with directed sprays of kresoxim methyl in monitored spray programme.