

the copper injury was the severest in early stage of shooting, and the injury was gradually weakened according to growth of leaf. In fruit, the copper injury was more severe in midsummer (August) than early of summer and spring season (June and July). Among copper fungicides, the bordeaux mixture which made by level of farm induced the most injury compared to other copper fungicides commercialized. Less copper spray injury was observed on treatments in which copper fungicide was sprayed as tank mixtures with paraffin oil when compared to treatment which sprayed with only copper fungicide.

E-62 Effects of Flusulfamide Granule against Chinese Cabbage Clubroot Caused by *Plasmodiophora brassicae*. X.Z. Zhang¹, S.U. Lee², J.S. Kim³, Y.S. Yoon¹, G.S. Choi¹, H.K. Kim¹, B.S. Kim¹. ¹Dept. Applied Plant science, Kangnung National University, Gangneung, 210-702; ²Young Il Chemical Co., LTD, Daejeon; ³Lab. Of Crop Protection, National Institute of Highland Agriculture, RDA, Korea

To investigate control efficacy of flusulfamide GR (granule) on Chinese cabbage clubroot caused by *Plasmodiophora brassicae*, experiment was accomplished in field located in Gangneungshi alpine area contaminated by *Plasmodiophora brassicae*. Flusulfamide GR provided 84.6% in control value and that was statistically significant difference from standard fungicides containing untreated control. To investigate ratio of reduction of resting spore according to fungicide treatment, soil of Chinese cabbage field before and after fungicide treatment were sampled and investigated density of resting spore. Resting spore density was not uniform in soil before fungicide treatment. Therefore, to investigate control efficacy of fungicide against clubroot, investigation on resting spore density was conducted before experiment and reflected in experimental design. Flusulfamide GR and DP (dust powder) provided 64.2% and 63.7% in ratio of reduction of resting spore on field soil after fungicide treatments. This result indicated that control efficacy was correlated with reduction of resting spore. When yield of each treatment was examined, flusulfamide DP, flusulfamide GR, fluazinam DP and trifloxystrobin SC (suspension concentrate) provided 14.3%, 13.0%, 13.8% and 3.8%, respectively in increasing rate in fresh weight of above-ground part comparing with untreated control. From above result, flusulfamide GR have outstanding control efficacy against clubroot of Chinese cabbage and is effectively decreasing of resting spore density in soil.