T1 Formulation Design of 1-kg Granule Based on the Releasing Behavior Analysis of Active Ingredients in a Rice Paddy Field

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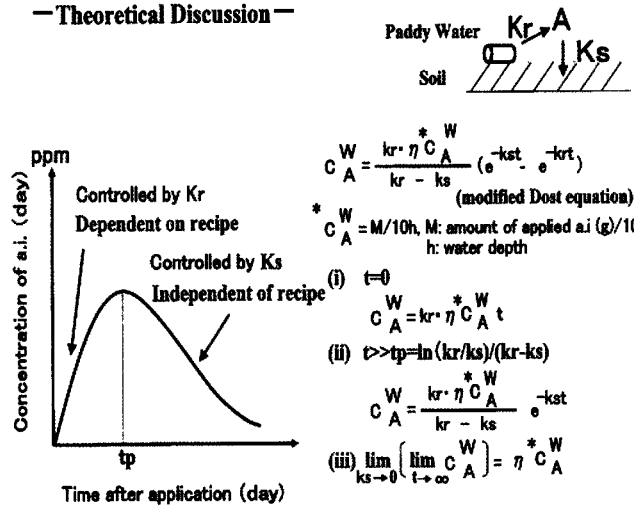
Since 1990s Japanese agriculture has dramatically changed. Due to only a few successors to agriculture and aging of agricultural families, the conventional application of agrochemicals stepping into a rice paddy field was one of the heaviest farm works for farmers especially for the aged and female. In response to the increasing social demand from farmers "easy to apply agrochemicals without stepping into a rice paddy field even for the aged and female", agrochemical companies in Japan have developed and commercialized many superior laborsaving formulations applied into a rice paddy field, that is, jumbo, mametsubu, suspension concentrate, 1-kg granule etc. for herbicides and nursery box granules, unmanned helicopter application etc. for fungicides and insecticides. In this study, formulation design of 1-kg herbicide granules based on the releasing behavior analysis of active ingredients in a rice paddy field is reported. 1-kg granule was prepared in a usual method using slurry of wet-milled active ingredients, premix of air-milled active ingredient, granules disintegration agent, binder, some surfactants, bentonite and calcium carbonate. That is, all materials were mixed, wet-granulated (screen diameter 1.0 mmϕ), dried and then sieved. The releasing behavior of active ingredients was investigated using artificial miniature paddy field in the container (900cm^2 area). Herbicide 1-kg granule was applied into the above paddy field (water depth kept at 3cm) and the paddy water was sampled after application and the concentration of active ingredients was determined with HPLC. Releasing behavior of active ingredients ($M/10hS_A \leqq 1$, M: the amount of applied a.i.(g)/10a, h: water depth, S_A: water solubility) was satisfactorily elucidated using following equations (in Fig.1) and we found that 1-kg formulation can be rationally designed by using the equations from a point of biological efficacy.

Fig.1 Releasing behavior of active ingredients in a rice paddy field

—Theoretical Discussion—



concentration of a.i.A in paddy water

releasing rate constant

dissipation rate constant

releasing efficiency into paddy water

^{W}:theoretical concentration of a.i. in paddy water

ime at maximum concentration

f a.i.A in paddy water