Simulation of fertility behavior of natural populations of rice at two environments using L-system

Lakshmi P. Subedi¹ and Tara N. Subedi²

¹Department of Plant Breeding, Institute of Agriculture and Animal Science (IAAS), ²Center for Information Technology, Institute of Engineering (IOE), Tribhuvan University, Nepal

Keywords: spikelet fertility, L-system, simulation, rice genetics

Introduction

In two populations of rice in Nepal: a bold grain variety, Taichung, and a long grain variety, P. Masino, the partial sterile panicles were collected from two different places in Bhaktapur, a hilly district. Parental or most prevalent genotype had 81.3% (with pink apiculus type hybrid swarm, Taichung type) and 82.9% (with brown apiculus type hybrid swarm, P. masino type) spikelet fertility. The partial sterile panicles were of two types: I → 7.7-8.9% fertility and II→30% fertility. The relative frequencies of the sterile types varied from 1-2% per plot (±100sq m) to even 50% per plot among different farmers’ fields. A view of partial sterility is given below:

The distribution of spikelet fertility was trimodal. These data will be simulated considering 3 loci: A, B and C affecting fertility. Let α be frequency of fertile spikelets, N be the total number of spikelets, πi be the effect of each loci and hi be the out-crossing rate. The expression can be written as α=θ(N,π, and h) based on Matsubara et. al. (2003).

Simulation programs

Plant growth and development of rice field will be simulated through cpfg modified from Watanabe et. al. (2005), a visual output is provided below:
Similarly, flowering as affected by temperature and day length will be simulated. Pollination or pollen flow will also be simulated as given below:

Then the spikelet fertility as described previously will be simulated.

References: