OA-05

Effect of variable rate fertilizer application on rice growth and quality under the soil testing and diagnosis of plant

Jae-Hong Lee[1],*, Chang-Soeng Kang[2], Jeong-Hyun Chi[1], Byoung-Roul Choi, Hee-Dong Kim[1], Kyeong-Yeol Park[1], Ho-Jin Lee[3]
[1]Crop Research Division, Gyeonggido Agricultural Research and Extention Services, Hwaseong 445-300, Republic of Korea
2Environmental Agriculture Research division, Gyeonggido Agricultural Research and Extention Services, Hwaseong 445-300, Republic of Korea
3Department of Plant Science, Seoul National University, Seoul 151-741, Republic of Korea

This study was carried out to verify the applicability of variable rate fertilization management(VRFM) under the soil testing and diagnosis of rice plant for high quality rice production of var. Chucheongbyeo on-farm level. The field trials were done in Gyeonggi, Ichoen where had 45 experimental fields for adoption of VRFM and 15 control fields for comparative study. Control fields were managed by practical cultivation method of each rice growers. Fertilizer applications of each experimental field were prescribed by soil testing result, but N fertilizer amount of top-dressing at panicle initiation stage was calculated by the equation, $7.5=7.379403-(5.27E-7)a-0.013291b+ (3.025355E-13)a^2+(3.222997E-8)ab+(6.781E-05)b^2$, where a means plant growth value(plant height×number of tillers×SPAD value) and b is nitrogen fertilization rate at panicle initiation stage on the basis of N 11kg/10a, and 7.5 is variable constant as a target protein content of brown rice. As the application of VRFM, N fertilizer amount of experimental field was reduced by 30% on the other hand P_2O_5 was increased by 15% compared with that of control field. Plant height and tiller number of experimental field was significantly shorter and more than those of control field, respectively. Coefficient of variation (C.V.) of every growth characters measured in experimental field was lower than that of control field at panicle initiation stage. There was no difference in culm length, panicle length, and panicle number between them at ripening stage, but C.V. of panicle numbers/m^2 was decreased in experimental field compared with that of control field. Rice yield was not different between them in spite of higher brown rice recovery and 1,000 grain weight. Under the management of VRFM, perfect rice yield was increased due to the increase of perfect rice ratio accompanied by the drop in brown rice protein content and variation of quality characteristics. In order to produce high quality rice reducing quality difference through increasing uniformity of growth among fields, VRFM was estimated highly effective as a adaptable fertilizer management method.

OA-06

Genotypic variations of grain yield and quality in rice exposed to experimental warming with elevating CO_2

Myoung-Seok Lee, Byoung-Man Kang, Woo-Jung Choi, Han-Yong Kim*
College of Agriculture & Life Science, Chonnam National University, Gwangju 500-757, Korea

Understanding the genotypic variations of grain yield and quality in rice (*Oryza sativa* L.) under global warming with elevating CO_2 is crucial to elicit an adaptation strategy for the expected climate change. Using six temperature gradient chambers, established in paddy fields, we investigated the grain yield and quality of two rice cultivars [Ilmibyeo (panicle number type) and Pyounganbyeo (panicle weight type)] with different ecotype under a combination treatment of three levels of air temperature [ambient temperature (25.9℃) ~ +2.4℃] and two levels of CO_2 concentration [ambient CO_2 (370ppmV) and 280ppmV above ambient]. Over cultivars, the warmer temperatures (1.3 ~ 2.4℃) than ambient decreased panicle number per square meter by 3 ~ 15%, whereas elevating CO_2 affected positively over all temperature regimes. The stimulative effects of elevating CO_2 on panicle number were greater in Ilmibyeo compared with Pyounganbyeo, resulting in increase by 21%, 23% and 31% for Ilmibyeo, and by 18%, 24% and 7% for Pyounganbyeo in ambient temperature, 1.3℃ and 2.4℃ warmer temperature, respectively. Warmer temperatures also reduced spikelet number per panicle across cultivars and CO_2 concentrations, leading to the decrease in grain yield. The decreased yield due to warmer temperatures was greater in Pyounganbyeo than in Ilmibyeo over CO_2 concentrations: 2 ~ 28% in Ilmibyeo and 10 ~ 49% in Pyounganbyeo depending on the extent of warmer and CO_2. This was largely attributed to greater warmer-induced floral sterility in Pyounganbyeo. Over cultivars, warmer temperatures reduced the fraction of head rice. Furthermore, the decreased head rice caused by warmer temperatures was exacerbated with elevating CO_2, displaying a negative temperature × CO_2 interaction for the fraction of head rice. Protein content of the polished rice was decreased with elevating CO_2 but increased with rising temperature over cultivars. These results may suggest that selecting rice cultivar with panicle number type rather than with panicle weight type is likely to be beneficial for adapting to elevating temperature and CO_2.