

REACTION OF RICE VARIETIES TO THE PHYTOTOXICITY OF A NEW HERBICIDE, ROUNDUP

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INTRODUCTION

In the recent screening experiments for new herbicides conducted by some experiment stations in Taiwan, Roundup was found to be highly toxic to rice. The occurrence of certain varieties of specific crops resistant to particular herbicides has been reported frequently. Price and Klingman (1958) reported that wheat and oat varieties responded differently to varying treatments of 2,4-D. Hodgson et al. (1964) also detected differential response of certain barley and wheat varieties to 7 herbicides. Information of this type could be of great value in screening programs of new herbicides. This experiment was conducted to determine the phytotoxicity of Roundup on a japonica and an indica varieties of rice.

MATERIALS AND METHODS

Two rice varieties, Chianung 242, a Japonica-type "ponlai" variety developed by the Chiayi Agricultural Experiment Station and IR 8, an indica variety released by the International Rice Research Institute (IRRI) were used in this experiment. The chemical, Roundup, used in this experiment is a product of the Monsanto Company, USA. The Roundup is a combination of Ramrod (CP 31393, 2 Chloro-N-isoprophylacetanilide) 7.5% and 2,4-D (2,4-dichlorophenoxyacetic acid) at 2.5% for a total active percentage of 10% in granular formulation. It was applied at two stages namely at 3 and 10 days after transplanting at the rate of 0.5, 1.0, 2.0 and 4.0 kgs. ai/ha (or 5, 10, 20, and 40 kgs product/ha), with a non-application included as a check treatment. Two rice varieties, 2 dates of application, and 5 dosage rates were combined in a $2 \times 2 \times 5$ factorial experiment in randomized complete blocks with 3 replications. The experiment was conducted in the screen house of the Chiayi Agricultural Experiment Station. Clay pots with total area of 314 cm² per pot were used for the planting of rice. Two-week old seedlings were transplanted on August 30, 1967 with 3 seedlings in each pot. Ammonium sulphate, calcium superphosphate, and potassium sulphate were used as carriers of N, P₂O₅, and K₂O which were applied at the rate of 100, 50, and 50 kgs per ha, respectively. Phytotoxicity readings were made at 4 weeks after transplanting by an arbitrary 0-4 scale devised by the author.

RESULTS AND DISCUSSION

Rice plant showed symptoms of toxicity about one week after the chemical was applied. Chlorosis on leaf blade was the first symptom of toxicity visible on rice plant. Later when rice plant was more severely affected, it showed a sign of stunting and leaf blades at the lower part started to wilt. A complete kill of rice plants in plots applied with higher dosages of chemical was detected at 2 to 3 weeks after the application of the

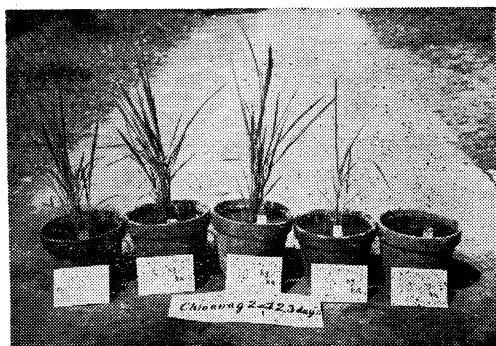
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chemical. The results of phytotoxicity rating made at 4 weeks after transplanting is given in Table 1 as well as in Figure 1.

Table 1. Phytotoxicity rating of rice plant at 4 weeks after transplanting*

Variety	Date of application (days after transplanting)	Active rate (kg/ha)				
		CK	0.5	1.0	2.0	4.0
Chianung 242	3	0	0	0	1	4
	10	0	0.5	1	3.5	4
IR 8	3	0	0	0.5	2.5	3.5
	10	0	1	2.5	4	4

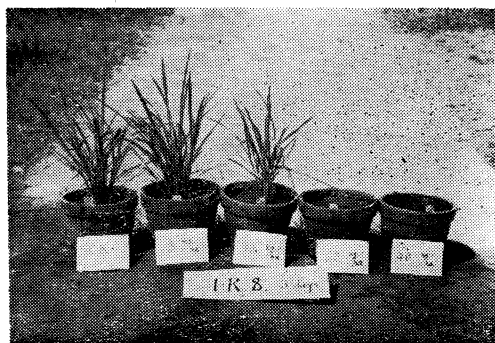
*0=no toxicity, 4=heaviest toxicity or complete kill of rice plant.



Chianung 242, 3 days.



Chianung 242, 10 days



IR 8, 3 days,



IR 8, 10 days.

Figure 1. Rice plants showing different degree of phytotoxicity symptoms at 4 weeks after transplanting.

Table 1. Shows that Roundup applied at the rate of 0.5 and 1.0 kg per ha of active ingredient did not cause any serious injury to rice plant. However, severe toxicity was evident when the rate exceeded 2.0 kg per ha of active material. The results of this experiment were slightly different from those obtained at IRRI (Moomaw, 1967) where only a light toxicity was recorded even the dosage rate was as high as 4.0 kg per ha. Since the recommended rate of this chemical is about 3.0 to 5.0 kgs of active material per ha for the effective control of weeds, Roundup as the present 10% granular specially made for evaluation in Taiwan appears unacceptable for paddy rice.

Roundup applied 3 days after transplanting appeared to cause less toxicity on rice plant in comparison with that of 10 days after transplanting, indicating that toxicity of this chemical on rice may be greatly reduced if early post-emergence or pre-emergence applications are made.

Chianung 242 was found to be more tolerant to the toxicity of Roundup than IR 8, although the difference is not so great. The result seems to suggest that japonica variety is more resistant to this particular chemical injury. Okamoto *et al.* (1960) also reported that japonica varieties of rice were generally more resistant to the toxicity of phenyl mercuric acetate whereas most indica ones are highly sensitive to the toxicity of this fungicide.

SUMMARY

The reaction of a japonica-type rice variety, Chianung 242, and an indica-type rice variety, IR 8, to the toxicity of a new herbicide, Roundup, was evaluated at the Chiayi Agricultural Experiment Station in September of 1967. Roundup exceeded the active rate of 2.0 kg per ha was highly toxic to rice plant. The phytotoxicity of rice plant was lighter when Roundup was applied at 3 days instead of 10 days after transplanting. Japonica rice variety, Chianung 242 appeared to be more tolerant to the toxicity of Roundup than indica variety, IR 8.

LITERATURE CITED

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水稻品種對新殺草劑 Roundup 藥害之反應

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摘 要

本試驗以測定不同型水稻品種對新殺草劑 Roundup 藥害之反應為目的。供試材料為日本型品種，嘉農242號，印度型品種，IR8 等兩品種。Roundup 由 Ramrod (CP 31393)7.5%與 2,4-D 2.5%混合製成爲有效成分10%之粒劑，是美國 Monsanto 公司爲在臺灣試驗而特別製成之產品。其施用量分爲對照，每公頃有效藥量0.5，1.0，2.0及4.0公斤，分別於插秧後3日及10日撒施於盆栽水稻，並按各處理藥害之輕重分級計分。由此調查結果得知，Roundup 對供試水稻品種均具藥害，惟日本型品種，嘉農242號呈現藥害之程度似較印度型品種，IR8 者輕微。Roundup 施用量若超過每公頃有效成分2.0公斤以上時，就能引起供試水稻品種嚴重之藥害，惟插秧後3日施用者似較插秧後10日施用者爲輕。