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EFFECTS OF CULTIVAR-TILLAGE SYSTEM COMBINATION ON MYCORRHIZAL POPULATION

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ABSTRAK

Pengaruh kombinasi sistem olah tanah dan varietas terhadap populasi mikorisa. Suatu penelitian telah dilakukan untuk mengetahui pengaruh kombinasi sistem olah tanah dan varietas terhadap populasi mikorisa. Penelitian terdiri atas empat perlakuan yang disusun dalam rancangan acak kelompok. Perlakuan tersebut adalah varietas RR ditanam pada sistem olah tanah konservasi (RRCT), varietas C7 ditanam pada sistem olah tanah konservasi (C7CT), varietas C7 ditanam pada sistem olah tanah sempurna (C7FT), dan varietas Bisma ditanam pada sistem olah tanah sempurna (Bisma FT). Hasil penelitian menunjukkan bahwa pada pengamatan pertama C7FT secara nyata menurunkan populasi mikorisa dibandingkan dengan Bisma FT. Pengamatan kedua, sistem olah tanah dan varietas tidak berpengaruh terhadap populasi mikorisa. Pada pengamatan ketiga menunjukkan bahwa RRCT secara nyata dapat menurunkan populasi mikorisa dibandingkan dengan Bisma FT.

Key words: corn cultivar, tillage, mycorrhizae

INTRODUCTION

One of the main problems in developing corn production is how to manage weed on corn crop. So far, the managment of weed still needs high cost, especially for full tillage. Beside that, the implementaion of full tillage for along time could cause severe soil erosion. Soil erosions degrade soil structure, decrease soil fertility, and reduce the number of microorganism, including vesicular-arbuscular mycorrhizal fungi. Allen and Boosalis (1983) showed that mycorrhizal fungi population decreased under fallow rotation compared to grassland. Kruckelmman (1975) showed that tilling by rotary hoe tended to decrease spore number of mycorrhizal fungi.

The herbicide application could decrease the cost, but there could be negative side effect. Ussually, herbicide applications cause phytotoxic to the plant. Thus, the herbicide must be applied very carefully.

Application of conservation tillage by using herbicide is a rational way of weed management. As mention above, the problem is the phytotoxic effect of the herbicide to the plant. RR-corn cultivar promisses to solve this problem. RR-corn cultivar has tolerant character to glyphosate, the plant could grow normally under glyphosate spraying (Kishore *et al.* 1992). However, many reports showed that the use of chemical material to the soil caused negative side effect to vesicular-arbuscular mycorrhizal fungi (Menge, 1982). The present work, therefore, undertaken in an attempt to study the effect of corn cultivar-tillage system combination on mycorrhizal fungi population.

METHODS

The experiment was conducted in Natar, South Lampung, from September 2000 to February 2001.

The experiment consisted of four treatments with six replicates arranged in completely randomized design. The treatments were cultivar RR-corn grown under conservation tillage (RRCT), cultivar C7 grown under conservation tillage (C7CT), cultivar C7 grown under full tillage (C7FT), and cultivar Bisma grown under full tillage (Bisma FT). In the full-tillage, the land was plowed completely (September 30 and October 7), while in the conservation tillage glyphosate herbicide was sprayed over the plots. Seeds were sowed on November 14 for full tillage, September 30 for RR-corn, and October 7 for C7 with conservation tillage. Glyphosate was blankedly sprayed over the RR-corn plot on October 14 and November 4. Glyphosate was also blanketly spraye over C7CT plot on September and sprayed between row on November 4.

Soil sampling conducted three times. Soil samples were collected from corn rhizosphere of each experimental unit. Soil sample for mycorrhizal fungi population (100 g) were extacted using the method from Daniels and Skipper (1982). The collected

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chlamidospores were counted under microscope in 1 ml volume.

RESULTS AND DISCCUSION

The results of the first observation (Table 1) showed that corn grown under conservation tillage (the use of glyphosate) tended to decrease mycorrhizal fungi population compared to Bisma grown with full tillage, but not significantly different. This observation also showed that C7 grown with full tillage significantly decreased mycorrhizal fungi population compered to Bisma grown with full tillage; and not significantly different compared to corn grown under conservation tillage. This observation also showed that C7 grown with full tillage tended to decrease mycorrhizal fungi population compared to corn grown under conservation tillage, but not significantly different.

Table 1. Number of mycorrhizal chlamidospore per g soil under corn cultivar-tillage system combination

Tillage System X Cultivar	1*	2	3
Conservation Tillage			
RR	25.0 ab	18.8 a	18.1 a
C7	25.4 ab	19.3 a	35.3 ab
Full Tillage			
C7	13.8 a	21.1 a	23.7 ab
Bisma	31.6 b	15.3 a	40.1 b

Notes: average number in the same column followed by different letters are significantly different, while those followed by the same letters are not significantly different (protected LSD, $\alpha = 0.05$).
* Observation .

Data obtained from the second observation showed that there were no differences among the treatments tested. There were no differences between the treatments in the same tillage. There was also no differences between conservation and full tillage.

The results of the third observation showed that C7 grown with conservation tillage and full tillage tended to decrease mycorrhizal fungi population compared to Bisma grown with full tillage, but not significantly different. This observation also showed that RR-corn grown with conservation tillage significantly decreased mycorrhizal fungi population compared to Bisma.

The decrease of mycorrhizal population in this experiment could be caused by several fators. As in the first observation, the significant decrease of mycorrhizal population of C7 grown with full tillage compared to Bisma grown with full tillage, probably due to the leaves of C7 that were more intensively covered the weed from sunshine. Shading could decrease mycorrhizal infection and then decreased mycorrhizal fungi population. This also may due to longer time in fallow condition of C7 grown with full tillage than Bisma grown with full tillage (Allen dan Boosalis, 1983; Yokom *et al.,* 1985) . The decrease of mycorrhizal population in the third observation (between RR-corn and Bisma) probably due to shading and glyphosate. Glyphosate decreased mycorrhizal fungi population through the decrease of weed population, the host of mycorrhizal fungi other than corn.

CONCLUSION

C7FT (first observation) and RRCT (third observation) significantly decreased mycorrhizal population.

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REFERENCES

Allen, M.F. & M.C. Boosalis. 1983. Effect of two species of VA mycorrhizal fungi and drought tolerance of winter wheat. New Phytol. 93:67.

Daniels, B.A. & H.D. Skipper. 1982. Method for recovery and quantitative estimation of propagules from soil. Pages: 29-36, in Methods and principles of mycorrhizal research. N.C. Schenck (ed.). APS, St. Poul, Minnesota.

Kishore, G.M., S.R. Padgette, & R.T. Fraley. 1992. History of herbicide-tolerant crops, methods of development and current state of the art-emphasis on glyphosate tolerance. Weed Tech. 6: 626-634.

Kruckelmman, H.W. 1975. Effect of fertilizers, soil, soil tillage, and plant species on the frequency of endogone chlamidospores and mycorrhizal infection in arable soil. Pages:512-525, in Endomycorrhizas. F.E. Sanders, B. Mosse, and P.B. Tingkers (eds.). Academic Press, London.

Menge, J.A. 1982. Effect of soil fumigants and fungicides on vesicular-arbuscular fungi. Phytopathology 72: 1125-1132.

Yocom, D.H., H.J. Larsen, & M.G. Boosalis. 1985. The effect of tillage treatments and fallow seasons on VA mycorrhizae of winter wheat. Page: 297, in Proceedings of the 6th North American Conference on Mycorrhizae. R. Molina (ed.). Forest Research Laboratory, Bend, Oregon.