Effect of intercropping forages on root growth of fruit tree and orchard ecology

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Introduction Intercropping forages in young orchards not only could fully utilize the land resource to solve a conflict between orchard and pasture, but also could improve the microclimate of hilly orchards (Qi et al, 1993). In contrast, some articles reported that planting mulch grasses in orchard could lead to conflicts of competing water and nutrients between grasses and fruit trees (Catzeflis et al, 1997). This paper investigated the root distribution of forage-orchard compound system and effects of intercropping legume forage *Chamaecrista spp*. on the orchard ecology to provide scientific basis for water and fertilizer management of orchard.

Materials and methods Experiment 1: The experimental materials were five-year Longan trees and *Chamaecrasta rotundifolia* intercropped in Longan tree orchard. Randomized block design was employed. Experiment 2: Four treatments were imposed in a randomized complete block design with 3 replicates. Treatments were: A. Planting *C. rotundifolia* on built contour terraces and Bahia grass and Premier finger grass on the walls of terraces of the orchard; B. No grasses on built contour terraces and the walls of terraces compared with A; C. Planting fruit trees down-slope without building contour terraces, the slope was covered by forages; D. No grasses covered the slope compared with C.

Results (1) 88.2% roots of *C. rotundifolia* were concentrated in 0-20 soil layer, however 71.5% roots of Longan tree distributed in the lower soil layer (lower than 0-20cm) (Table 1), thus the overlapped rate of the root system of two different plants was less than 5%. (2) Compared with the weed-cleaning orchard, runoff amount of the red-earth orchard where intercropped *C. rotundifolia* for 3 years decreased from 2482.4t/hm^2 to 61t/hm^2; the available N, P, K content increased from 47.6, 2.3, 30.4mg/kg to 85.4, 9.0, 95.1mg/kg respectively; and soil porosity and soil moisture increased by 7.1% and 1.2% respectively (Table 2).

Table 1 *Root distribution of 5-year Longan trees (root number/m^2).*

Soil layer(cm)	Distance from the tree base (cm)					Sum	Percentage (%)
	50	100	150	200	250		
0-20	660	550	480	230	140	2060	28.5
20-40	870	800	860	370	180	3080	42.5
40-60	380	550	50	160	100	1240	17.1
60-80	330	120	0	60	70	580	8.0
80-100	130	110	0	0	40	280	3.9

Table 2 *Effect of intercropping* C. rotundifolia *in orchard on soil bulk density and porosity.*

Item	Soil layer(cm)	Treatment A	Treatment B
soil bulk density(g/cm^3)	0-10	0.98	1.05
	10-20	0.97	1.08
Porosity(%)	0-10	25.76	20.1
	10-20	25.70	17.1

Conclusions Planting *C. rotundifolia* outside the crown range of Longan trees had little effect on root growth of fruit trees and could reduce the runoff and sediment, raise soil fertility and improve the microenvironment of orchards.

References

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