

Influences of Intercropping and Nitrogen Supply on Flavonoid Exudation in Wheat Roots

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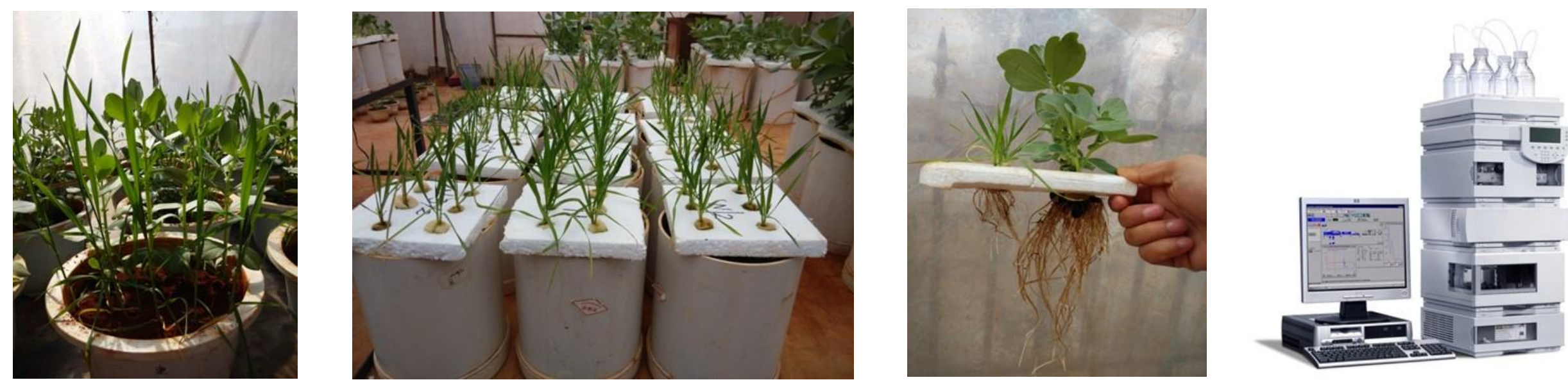


INTRODUCTION

Flavonoids are the key signal substances in root exudates of legumes. Previous studies have shown that there are three important flavonoid substances, naringenin, hesperetin and genistein, which promote nodulation and N₂ fixation. Meanwhile, intercropping patterns and N levels have significant effects on naringenin, hesperetin and genistein secretions of leguminous crops. However, the effects of intercropping and N level on secretions of naringenin, hesperetin and genistein in gramineous roots and the mechanisms of their influence on leguminous crop N₂ fixation are so far unclear in the leguminous and gramineous intercropping systems.

METHODS

Soil and hydroponic experiments comprising three cropping pattern treatments (wheat intercropped with faba bean, monocropped wheat, and monocropped faba bean) and three nitrogen (N) supply treatments at the deficient (50% N), adequate (100% N), and excessive (150% N) levels with three replicates in a randomized complete block design.



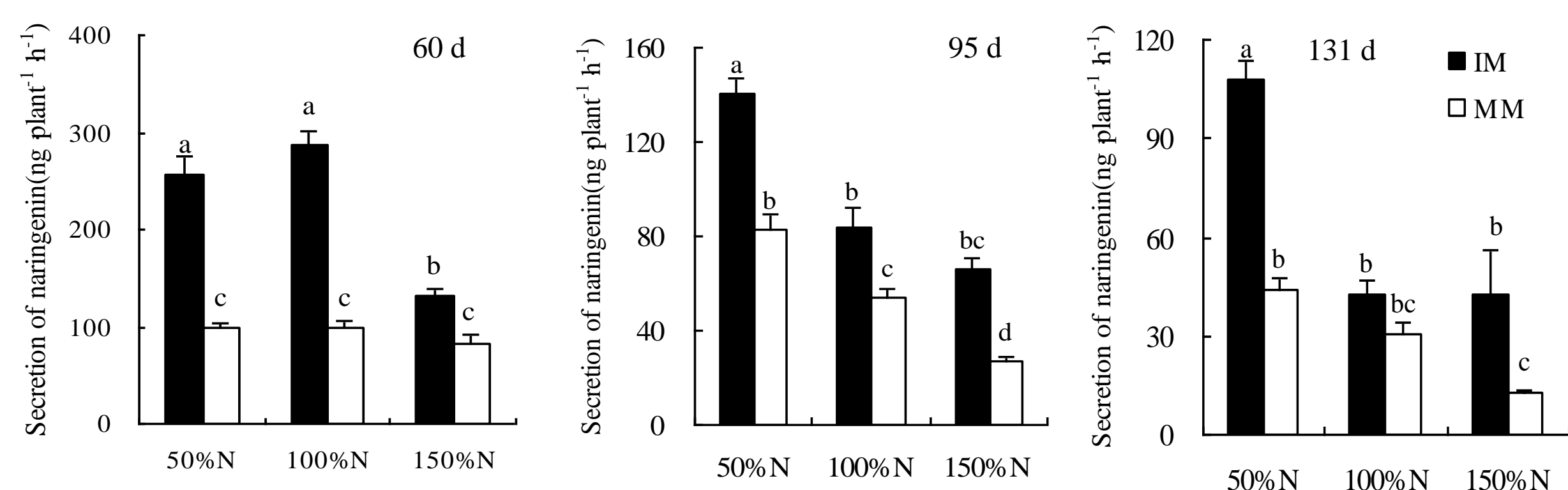
RESULTS

1. Yields

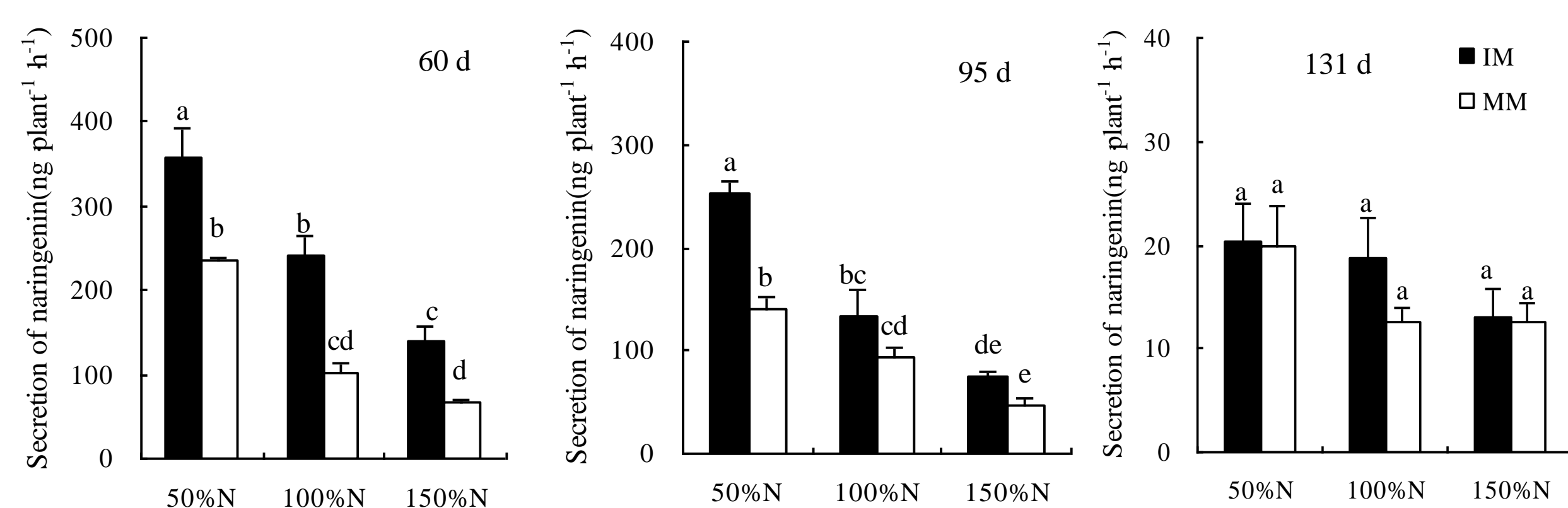
Experiment	Treatment	MF	IF	MW	IW
Soil experiment (g plant ⁻¹)	50% N	4.26 ^d	4.84 ^c	4.45 ^D	5.22 ^C
	100% N	5.08 ^c	5.62 ^b	5.21 ^C	5.95 ^B
	150% N	5.68 ^{ab}	6.06 ^a	5.41 ^C	6.29 ^A
Hydroponic experiment (g plant ⁻¹)	50% N	3.22 ^d	4.26 ^c	2.42 ^D	3.47 ^{BC}
	100% N	4.19 ^c	5.48 ^b	3.30 ^C	4.19 ^A
	150% N	5.27 ^b	5.98 ^a	3.66 ^B	4.42 ^A

Both cropping patterns and N supply levels significantly affected the grain yields of wheat and faba bean in the soil and hydroponic experiments.

2. Naringenin



Soil experiment

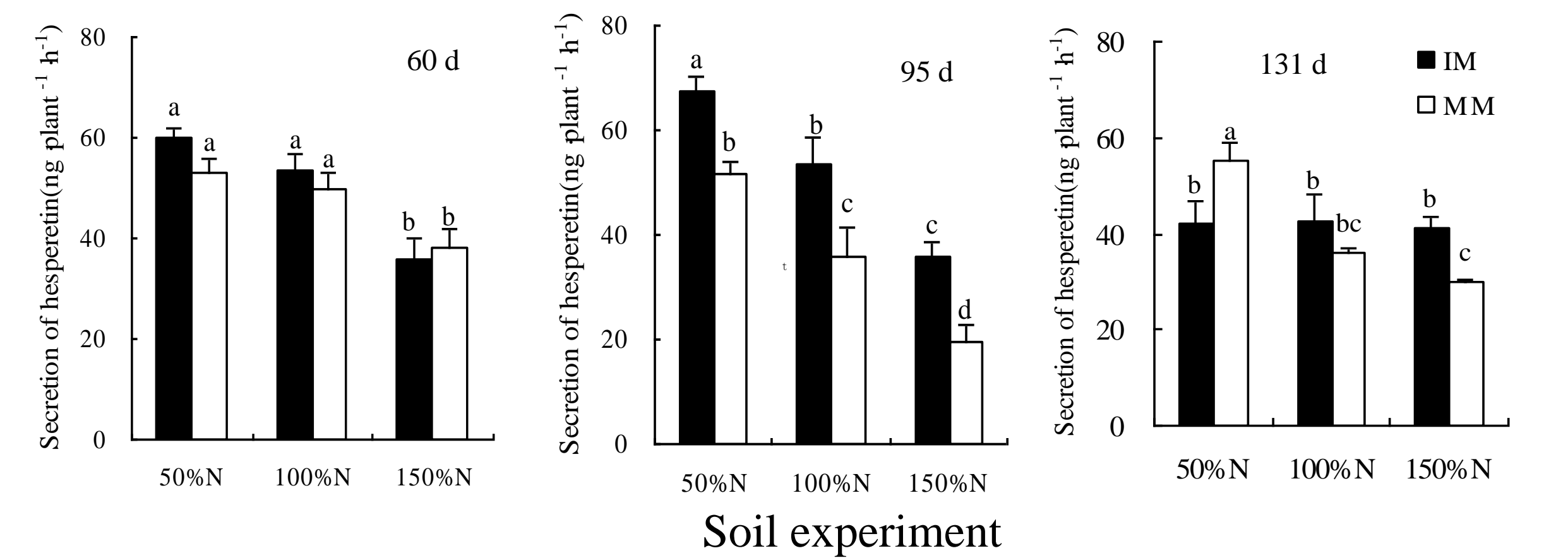


Hydroponic experiment

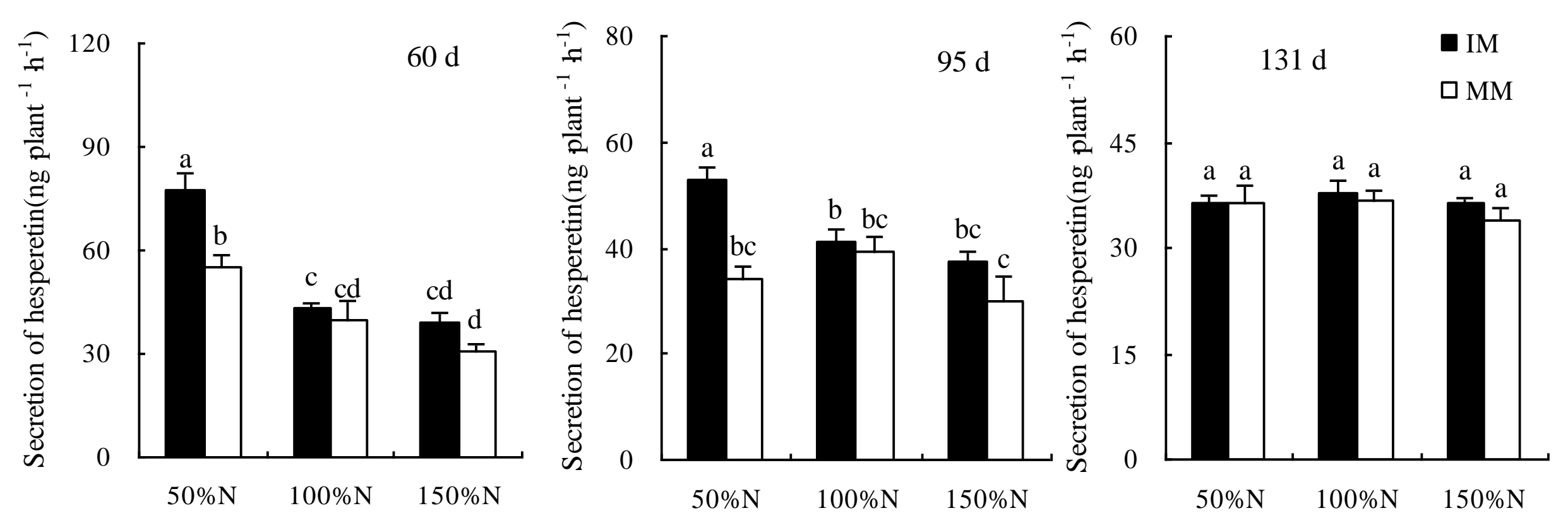
Wheat frequently exuded more naringenin when it was intercropped than when it was grown alone in all N treatments, increased N application frequently decreased secretion of naringenin in wheat roots.

RESULTS

3. Hesperetin



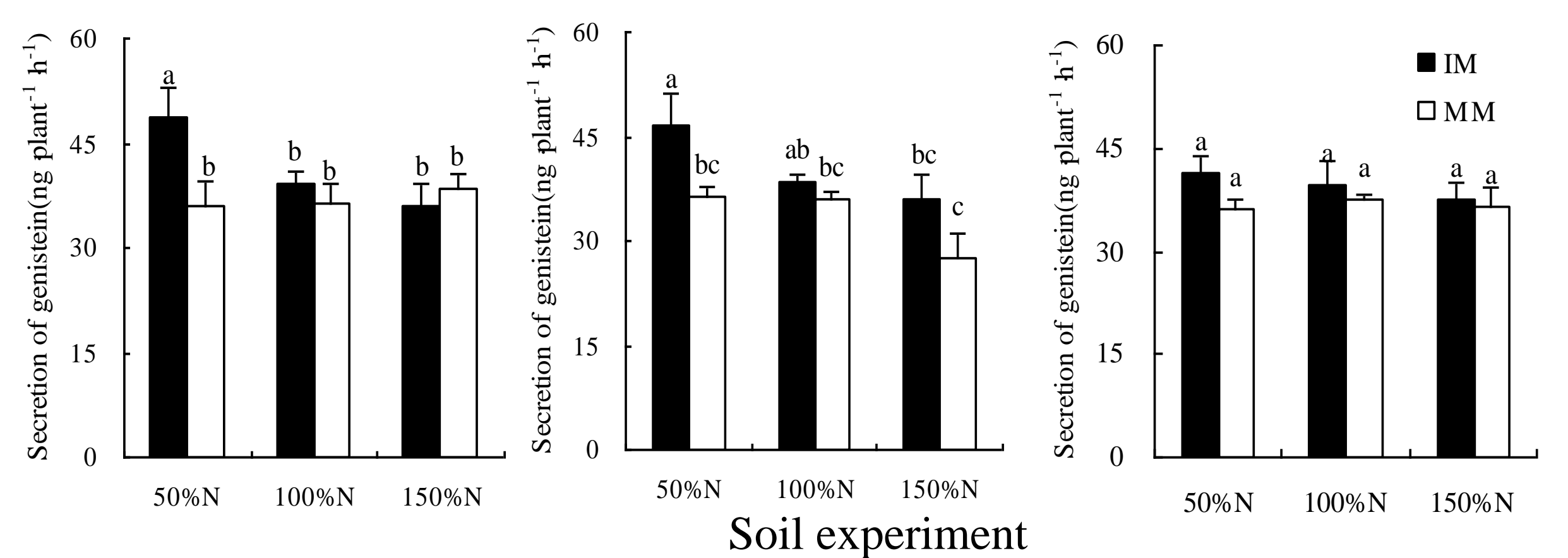
Soil experiment



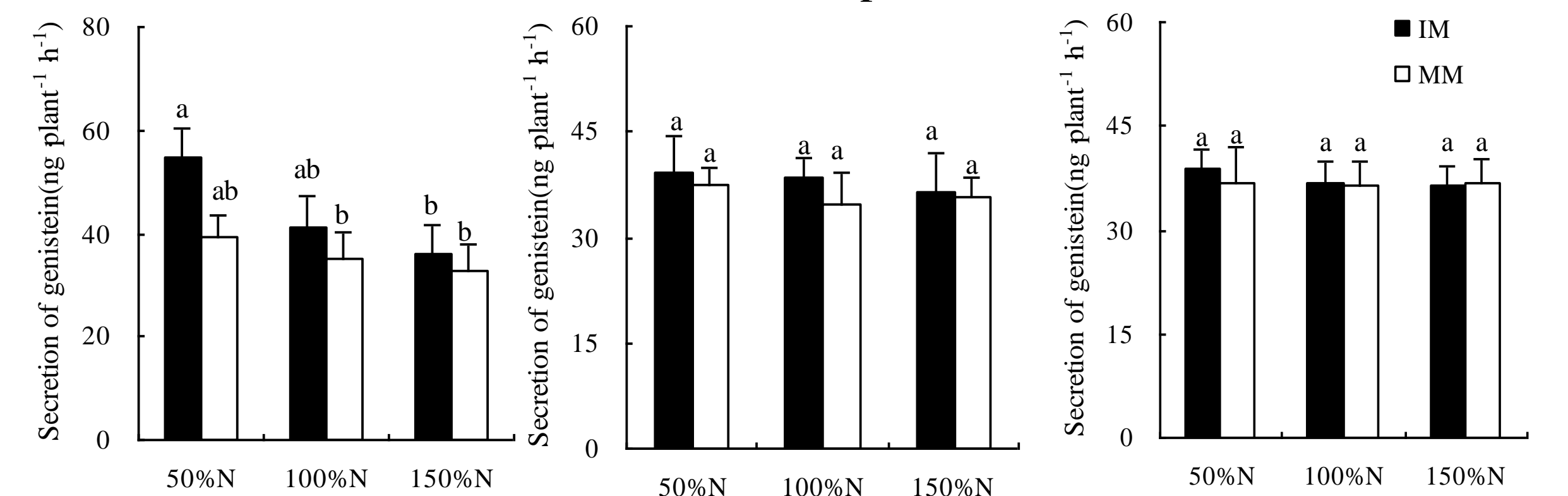
Hydroponic experiment

Intercropping variably increased secretion of naringenin from 0.5 to 1.9 folds (P<0.5) in wheat roots at all three N levels, but rarely increased secretion of genistein and hesperetin in wheat at the deficient N level.

4. Genistein



Soil experiment



Hydroponic experiment

Intercropped wheat secreted more flavonoids than monocropped wheat at its tillering (60th d) and flowering (95th d) stages; after the flowering stage, however, the differences between intercropping and monocropping were not significant at any N level. Secretion of flavonoids in wheat roots decreased with increased N supply.

CONCLUSIONS

Interspecies and N supply altered the contents and proportions of flavonoids in wheat root exudations under wheat and faba bean intercropping. Facilitative root-root interactions and provide insight into cereal promote nodule of legume and increase production in intercropping system.

ACKNOWLEDGEMENTS

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