

Nutrient Content Variation in Woodchip Fertilizers Treated with Single Chemicals

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Objectives

This research work was draft conducted regarding slow releasing fertilizer using woodchip. The main objective of this experiment was to find out the appropriate chemical which would be suitable for making woodchip fertilizers.

Materials and Methods

O Woodchip fertilizer

Five different kinds of woodchip were taken under consideration from □ *Pinus koraiensis* Sieb. et Zucc. □ *Pinus densiflora* Sieb. et Zucc. □ *Larix kaempferi* Carr. □ *Populus tomentiglandulosa* T. Lee and □ *Quercus* spp. Small diameter log of these five wood species were chopped into small pieces on an average size of 25mm x 15mm x 3mm. Eleven kinds of chemicals were sued for making fertilizer solutions, which were- ① Ammonium nitrate, NH_4NO_3 ② Tripotassium phosphate, K_3PO_4 ③ Dipotassium phosphate, K_2HPO_4 ④ Ammonium molybdate tetrahydrate, $(\text{NH}_4)_6\text{Mo}_7\text{O}_{24}\cdot 4\text{H}_2\text{O}$ ⑤ Potassium pyrophosphate, $\text{K}_4\text{P}_2\text{O}_7$ ⑥ Potassium nitrate, KNO_3 ⑦ Ammonium dihydrogen phosphate, $\text{NH}_4\text{H}_2\text{PO}_4$ ⑧ Diammonium hydrogen phosphate, $(\text{NH}_4)_2\text{HPO}_4$ ⑨ Ammonium phosphate trihydrate, $(\text{NH}_4)_3\text{PO}_4\cdot 3\text{H}_2\text{O}$ ⑩ Calcium nitrate tetrahydrate, $\text{Ca}(\text{NO}_3)_2\cdot 4\text{H}_2\text{O}$ and ⑪ Monopotassium phosphate, KH_2PO_4 .

O Estimation of nutrient content

Woodchip powder was made of woodchip fertilizer. From that powder, the percentage of nutrients N, P_2O_5 , and K_2O were estimated by Kjeldahl, Vanadate method and using ICP (Leman LAB PS series PS-950) respectively. Finally data was analyzed by statistical software- SPSS version 11.5.0.

Results and Discussion

O This experiment was carried out using 5 different kinds of woodchip for 5 replications. Among the wood species, three were from soft wood (*Pinus koraiensis*, *Pinus densiflora* and *Larix kaempferi*) and two were hard wood (*Populus tomentiglandulosa* and *Quercus*) species.

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O Nutrient content (N, P₂O₅ and K₂O) varied depending on chemicals used as stock solution (Fig. 1). The highest percentage of N (13.52%), P₂O₅ (19.51%) and K₂O (19.27%) were found in woodchip fertilizer when ammonium nitrate, diammonium hydrogen phosphate and potassium pyrophosphate saturated solution were used as stock solution respectively (Table 1). Woodchip fertilizer contained the highest amount of N than that of P₂O₅ and K₂O. This is because the ability of ammonia based solutions, can overcome the effects of pits aspiration and encrustation, and their ability to swell to improve permeability. There was significant difference among nutrient content in woodchip fertilizer when treated with different chemicals.

Table 1. Average nutrient content in different woodchip fertilizers when treated with different single chemicals

Chemicals used	Nutrient content in woodchip (%)		
	N	P ₂ O ₅	K ₂ O
NH ₄ NO ₃	13.52a		
K ₃ PO ₄		13.28 abc	17.90 a
K ₂ HPO ₄		13.75 abc	16.05 a
(NH ₄) ₆ Mo ₇ O ₂₄ ·4H ₂ O	8.09 b		
K ₄ P ₂ O ₇		17.05 ab	19.27 a
KNO ₃	9.66 b		14.55 a
NH ₄ H ₂ PO ₄	4.03 c	15.41 abc	
(NH ₄) ₂ HPO ₄	9.18 b	19.51 a	
(NH ₄) ₃ PO ₄ ·3H ₂ O	3.45 c	9.55 c	
Ca(NO ₃) ₂ ·4H ₂ O	8.53 b		
KH ₂ PO ₄		11.75 bc	6.40 b

In Duncan multiple comparison, mean with the same letter are not significantly different at p = 0.01

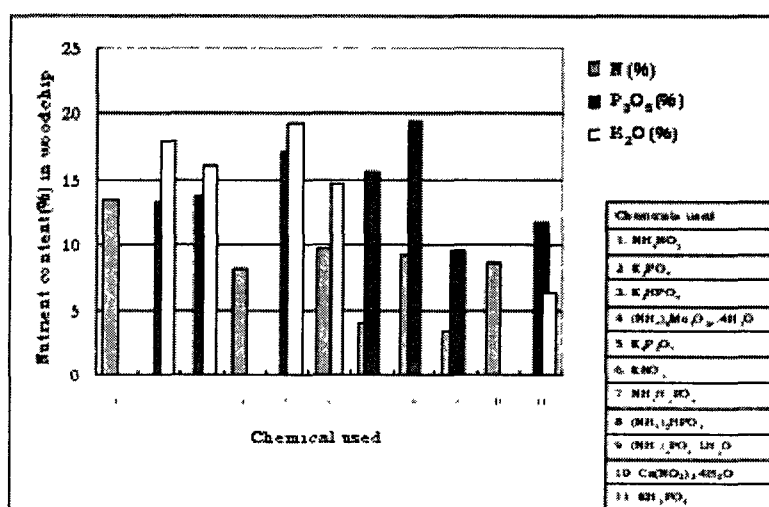


Fig. 1. Bar graph showing different fertilizer chemicals effect on nutrient retention in woodchip fertilizers. 1-11 are the chemicals used for making fertilizer solutions. Each bar represents the nutrient percentage in woodchip fertilizers