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## Effects of alfalfa stand age on rhizosphere soil phosphorus in saline soil

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**Key words :** saline-soil alfalfa , rhizosphere soil , bulk soil , total P , available P , P fractionation , pH

**Introduction** Alfalfa is the main perennial legume forage in northwest China . Alfalfa stands can accumulate large amounts of organic matter in the soil and improve physical and chemical characters of soil . Many researches have shown that growing alfalfa can greatly improve soil fertility . This study investigated effects of alfalfa stand age on rhizosphere phosphorus in saline soil .

**Materials and methods** The work was carried out at the Linze Grassland Faming Experimental Station (Hexi Corridor , western Gansu province) . The elevation was 1390m above sea level . The mean annual air temperature and annual precipitation were 7.6 °C and 121.5 mm , respectively . Five plots (55×33m<sup>2</sup>) were planted with alfalfa in 1998 (8 years old) , 2001 (5 years old) , 2002 (4 years old) , 2003 (3 years old) and 2004 (2 years old) . Ten well growing plants were randomly located within each site in full flowering stage . The rhizosphere soil sample was collected by shaking method . Phosphorus contents in all samples were measured colorimetrically using the molybdenum blue method (Murphy and Riley , 1962) on a UV/VIS Spectrometer . Total P and available P were determined by sodium hydroxide digest method and Olsen method respectively . pH was detected by pH Meter . A modified Hedley's fractionation scheme described by Tiessen (1993) and Sui (1999) was used in P fractionation .

**Results** There was no significant difference among stands in total P in rhizosphere soil and bulk soil . Available P in rhizosphere soil was higher than in bulk in all stands . Available P content in rhizosphere soil was greater in 5 years old stands than 2 years old stands but available P subsequently declined in 8 years old stands . In bulk soil , there were no significant difference of available P content among 3 , 4 and 5 years old stands , but all of them were higher than in 2 years old stands . and then it decreased remarkably in 8 years old stands . The pH in rhizosphere soil was lower than in bulk soil in all stands . The P fractionation included organic P (Po) fractionation and inorganic P (Pi) fractionation . In Pi portion , the NaHCO<sub>3</sub>-Pi , NaOH-Pi and hot conc . HCl-Pi (HHCl-Pi) contents in rhizosphere soil were significant higher than in bulk soil in all stands but there were no significant difference in the H<sub>2</sub>O-Pi and Ca-Pi contents among stands of different age . With the increase in plant age , all Pi fractions in rhizosphere and bulk soil increased except for the 8 years old stands , however , the NaOH-Pi in rhizosphere and bulk soil decreased from 2 to 8 years old stands . In Po portion , NaHCO<sub>3</sub>-Po and NaOH-Po in rhizosphere were significant higher than in bulk soil in all stands , but differences among HHCl-Po contents were not significant . NaHCO<sub>3</sub>-Po in rhizosphere and bulk soil decreased with the increase of plant age . The NaOH-Po increased from 2 to 5 years old stands , but decreased in 8 years old stands . There was no noticeable temporal change of HHCl-Po in rhizosphere and bulk soil . The difference of Residual-P contents between rhizosphere and bulk soil was also not significant . With the increase in stand age , the Residual-P in both rhizosphere and bulk soil decreased .

**Conclusion** Alfalfa stand age was a major driver of P form and P supply in rhizosphere soil in this saline system . The specific effect on soil P differed depending on stand age and the P fraction examined .