

*Sinorhizobium meliloti*

**Glyphosate**

E-mail : [fawz.alsafar@yahoo.com](mailto:fawz.alsafar@yahoo.com)

(2011 / 9 / 5 2011 / 5 /16 )

FA40 A39, FA38, FA37 *Sinorhizobium meliloti*

(2←1)β

FA37

45.7

FA37

Glyphosate

( / 10)

Glyphosate

*Sinorhizobium meliloti* :

## **Isolation and Identification of Local Isolates of *Sinorhizobium meliloti* and Studying its Tolerance Towards the Herbicide Glyphosate**

**Fawz A. AL-Safar**  
*Department of Biology*  
*College of Education*  
*University of Mosul*

### **ABSTRACT**

Four strains (FA37 FA38, FA39, and FA40 ) of *Sinorhizobium meliloti* were isolated from different agricultural areas of Ninaveh, Erbil and Duhok Governorates. Identification studies were conducted for these strains for their resistance to chloramphenicol, Erythromycin and production of cell surface molecules and their ability to grow in a Minimal Medium. Results showed that the four strains had the ability to resist both antibiotics, production of  $\beta(1\rightarrow2)$  cyclic glucan molecules and growth in Minimal Medium. The study of symbiosis relation between the strains and *Medicago sativa* plant showed that the strain FA37 was the most successful isolate in constructing symbiosis relation indicated by the dry shoot group, which reached 45.7 mg. The strain was then selected for further experiments. Results revealed that the strain FA37 had high resistance against different concentrations of the herbicide Glyphosate, whereas the plant showed no resistance against the least concentration 10  $\mu\text{g/ml}$  that the *Rhizobium* strains tolerated.

**Keywords:** *Sinorhizobium meliloti*, Glyphosate Herbicide

%25

Herbicides

5-enolpyruvyl shikimate -3-

Glyphosate

(Moorman , 1989)

(Amrhein and Steinruchen , 1980) phosphate (EPSP) synthase

Cinnamic acids

.(Becerril *et al.*, 1989)

Hydroxybenzoic

Shikimat

:

Glyphosate

..... *Sinorhizobium meliloti*

(1999) Hernandez .(Moorman *et al.* , 1992)  
Glyphosate

Shikimat

Protocatechuic

Glyphosate

(2005)

dos Santos

N-(phosphonomethyl)

Zappqi

Roundup Transorp

/

43.2

*Bradyrhizobium*

Ethylamine

YEM

*Bradyrhizobium*

Glyphosate

Glyphosate

YEM

Roundup Transport

(2005) Gómez

Zabaloy

*.Bradyrhizobium*

Glyphosate

Glyphosate

Glyphosate

SJ140

*Bradyrhizobium* sp.

*Sinorhizobium meliloti*

Glyphosate

*S. meliloti*

*Medicago sativa*

(MSY)

*S. meliloti*

4-2 ° 2±28

.(Vincent , 1970) *S. meliloti*

*Medicago sativa*

:

: (MSY)

.(Vincent , 1970)

( Khanuja and Kumar , 1988)

.(dos Santos, 2005) Glyphosate

:( RMM)

(Singh, 1948) .

: (NF)

*S.meliloti*

Glyphosate.

.( Engelke et al., 1987 )

/ 100 70 50

:

:

400 300 200 100

( Freifelder, 1983)

.(Hussein , 2000 )

/

:

*S. meliloti*

%0.02 Aniline blue

(3←1)β

..... *Sinorhizobium meliloti*

/ 0.1 (MSY)

Congo red

.( Swamynathan and Singh , 1995)

(2←1)β

**Glyphosate**

GLYPHOSATE I.P.A

Glyphosate

480

/Lizz agro-chemicals co., Ltd

.Glyphosate

**Glyphosate**

(MSY)

Glyphosate

(MSY)

. / 10

/

100 90 80 70 60 50 :

Control

.( dos Santos , 2005)

560

Spectrophotometer

*S. meliloti*

FA38 FA37 :

*S. melilot*

FA39

*Medicago sativa*

FA40

(1)

FA38 FA37

MSY

/ 400

*S. meliloti*

( Talaro and Talaro, 1996 )

.(Tate, 2000 )

.(Hussein , 2000 )

MSY *Sinorhizobium meliloti* :1

				µg/ml	
FA40	FA39	FA38	FA37		
++	++	++	++	100	
+	+	++	+	200	
-	-	+	+	300	
-	-	-	-	400	
+	+	++	++	100	
-	-	-	+	200	
-	-	-	-	300	
-	-	-	-	400	

- + ++

(3←1)β

.(Swamynathan and Singh , 1995 ) (2←1)β

( 3 ← 1 ) β

(2 ← 1)β

( 3 ← 1 ) β

*S. meliloti*

.(D'Antuono , 2005)

..... *Sinorhizobium meliloti*

(RMM)

.(MSY)

.(Prasad , 2000)

FA37 (2 )

45.7

.(1 )

NF

*Sinorhizobium meliloti*

:2

( )	/	( )	
1.3 ± 45.7	7.9 ± 1.3	22.1 $\alpha$ ± *0.6	FA37
2.9 ± 40.1	1.9 ± 6.5	1.1 ± 16.8	FA38
0.8 ± 40.0	1.4 ± 7.0	0.9 ± 17.3	FA39
1.1 ± 40.4	1.7 ± 7.5	1.2 ± 17.6	FA40
0.5 ± 8.7	—	1.5 ± 5.9	Control

SD

\*

$\alpha$



*Sinorhizobium meliloti*

:1

FA37

Glyphosate

(O.D.)

/

50

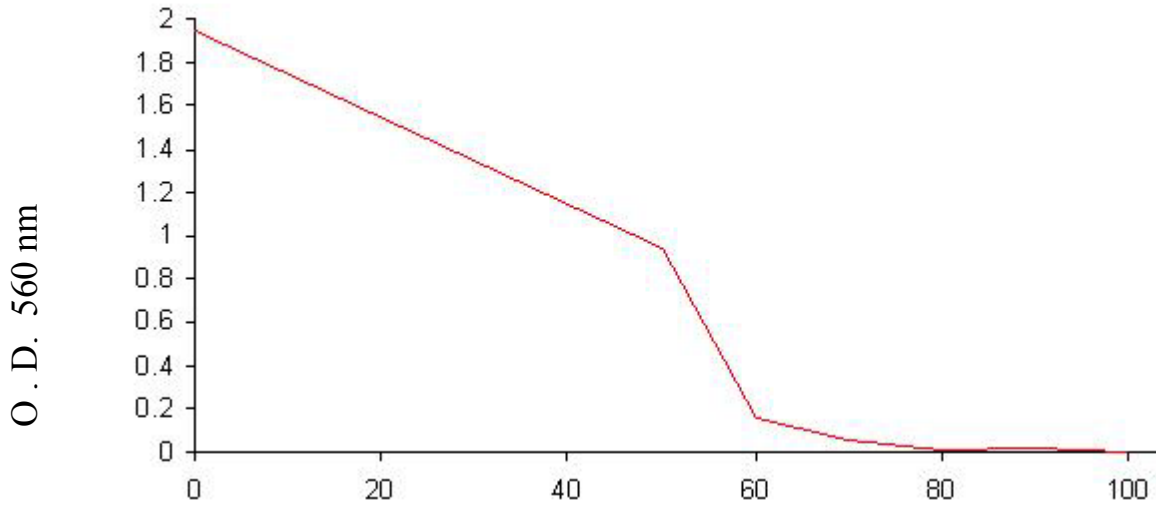
(%48.63)

90



..... *Sinorhizobium meliloti*

/ 100 /  
(2)



تركيز الـ Glyphosate مايكروغرام /مل

*Sinorhizobium meliloti* FA37 : 2  
.Glyphosate

/ 43.2 (2005) dos santos

5 SEMIA5087 A508A *Bradyrhizobium*

170 480

.( Pedrinoho *et al.*, 2002 ; Kishinevsk *et al.*, 1988 ; Jaworski *et al.*, 1972)

10

(NF)

/

*S. meliloti* FA37

Glyphosate

( )

- Becerril, J. M.; Duke, S.O.; Lydon, J. (1989). Glyphosate Effects on shikimate pathway products in leaves and flowers of velvetleaf. *Phytochemistry.*, **28**, 695-699.
- D'Antuono, A.L.; Casabuono, A.; Couto, A. Uglade, R.A. ; Lepek, V.L. (2005). Nodule development induced by *Mesorhizobium loti* mutant strains affected in polysaccharide synthesis. *Mol. plant microbe Int.*, **8**,155-164.
- dos Santos, J.B.; Ferreira, E. A.; Kasuya, M.C.; Da Silva, A. A. ; Procopio, S.O. (2005). Tolerance of Bradyrhizobium strains to glyphosate formulations. *Crop Prot.*, **24**, 543-547.
- Engelke, T.; Jagadish, M.N.; Pühler, A. (1987). Biochemical and genetic analysis of *Rhizobium meliloti* mutants defective in C4-dicarboxylate Transport. *J. Gen. Microbiol.* **133**, 3019-3029.
- Freifeider, D. (1983). "Molecular Biology A Comprehensive Introduction to Prokaryotes and Eukaryotes". Science Books International, Inc. USA.
- Hernandez, A.; Garcia-Plazaola, J. I.; Becerril, J. M. (1999). Glyphosate effects on phenolic metabolism of nódulated soybean (*Glycine max* L. Merr.). *J. Agric food chem.*,**47**(7), 2920-2925.11
- Hussein, I. A. (2000). Genetic and bioroduction to Prokaryotes and Euchemical studies on stress tolerance in Rhizobium. Ph.D. Thesis, University of Roorkee, Roorkee, India.
- Jaworski, E.G. (1972). Mode of action of N-phosphonomethylglycine: inhibition of aromatic amino acid biosynthesis. *J. Agric. Food Chem.* **20**, 1195-1198.
- Kishinevsky, B.; Lobel, R.; Lifshitz, N.; Gurfel, D. (1988). Effects of some commercial herbicides on rhizobia and their symbiosis with peanuts. *Weed Res.* **28**, 291-296.
- Khanuja, S.P.S.; Kumar, S. (1988). Isolation of phages for *Rhizobium meliloti* AK631. *Indian J. Exp. Biol.*, **26**, 665-667.
- Moorman, T. B. (1989). A review of pesticide effects on microorganisms and soil fertility. *J. Prod. Agric.*, **2**: 14-22.
- Moorman, T.B.; Becerrili, J.M.; Lydon, J.; Duke, S.O. (1992). Production of hydroxybenzoic acids by *Bradyrhizobium japonicum* strains after treatment with glyphosate. *J. Agric. Food Chem.*, **40** , 289-293.
- Prasad, C.K.; Vineetha, K.E; Hassani, R.; Randhawa, G.S. (2000). Isolation and symbiotic characterization of aromatic amino acid auxotrophs of *Sinorhizobium meliloti*. *Indian J. Exp. Biol.*, **38**, 1041-1049.
- Pedrinoho, J. R.; Martini, G.; Felici, G.V.; Piva, F.M.; Durigan, J.C. (2002). Momento da chuva após a aplicação e a eficácia dos herbicidas sulfosate glyphosate aplicados em diferentes formulações. *P. Daninha.* **20**,115-123.

- Singh, A., Ram, J.; Sikka, V.K.; Kumar, S. (1984). Derivation of marked strains in *Rhizobium leguminosarum* R1d1 by nitrosoguanidine and transposon mutagenesis. *Indian J. Exp. Biol.*, **22**, 239-247.
- Steinrucken, H.C.; Amrhein, N. (1980). The herbicide glyphosate is a potent inhibitor of 5-enolpyruvyl shikimic acid-3-phosphate synthase. *Biochem. Biophys. Res. Commun.*, **94**, 1207-1212.
- Swamynathan, S. K.; Singh, A. (1995). Pleiotropic effects of purine auxotrophy in *Rhizobium meliloti* on cell surface molecules. *J. Biosci.*, **20**, 17-28.
- Talaro, K.; Talaro, A. (1996). "Foundations in Microbiology". 2nd edn., Wm. C. Brown publishers, pp. 281-282.
- Tate, R.L. (2000). "Soil Microbiology III".. John Wiley and Sons, Inc. pp.37-403
- Vincent, J.M. (1970). "A Manual for the Practical Study of the Root-Nodule Bacteria". I.B.P. Handbook No. Blackwell Scientific Publication Ltd., Oxford.
- Zabaloy, M.C.; Gómez, M.A. (2005). Diversity of rhizobia isolated from an agricultural soil in Argentina based on carbon utilization and effects of herbicides on growth. *Biol. Fertil. Soils.*, **42**, 83-88.