

Table (1) : Effects of prebiotics and / or bacterin on the survival of *O.niloticus* after challenge with *H.alvei*.

Group No.	Treatment	Doses and method of applications	* No. of Deaths	Survival (%)
1	Glucan	100µg/ml for 30 minutes in bath	7	65
2	Sodium alginate	100µg/ml for 30 minutes in bath	6	70
3	Bacterin	100µg/ml <i>H.alvei</i> antigen for 2 minutes in bath	2	90
4	Bacterin + glucan	100µg/ml for each and for 2 minutes and 30 minutes, respectively in bath	1	95
5	Bacterin + sod.alginate	100µg/ml for each and for 2 minutes and 30 minutes, respectively, in bath	0	100
6	Challenged untreated	—	18	10
7	Unchallenged untreated	—	0	100

* Deaths recorded for 11 days post challenge.

Table(2):Antibody response of *O.niloticus* fish against *H.alvei* bacterin under different treatments of prebiotics. 72

Group No.	Treatment	Antibody titer (by log 2)						
		Before challenge	After challenge					
			12 h`*`	24 h`	48 h`	72 h`	96 h`	240 h`
1	Glucan	6.7	6.5	6.0	5.2	4.6	4.5	4
2	Sodium alginate	7.1	7.0	6.7	6.1	5.4	5.0	4.5
3	Bacterin	15.3	15.0	14.4	13.2	12.0	11.1	15
4	Bacterin + glucan	18.2	18.0	17.5	17.0	16.4	15.9	18.3
5	Bacterin + sod.alginate	18.8	18.5	18.0	17.0	16.3	16.0	19
6	Challenged untreated	3.1	2.7	1.8	0.3	6.6	15.9	7.2
7	Unchallenged untreated	3.1	3.1	3.1	3.1	3.0	3.0	3.0

* h` = Hours .

Table (3): Mean bacterial counts in the blood and spleen samples of *O.niloticus* fish administered prebiotics and / or bacterin and challenged with *H.alvei* .

Grop No.	Treatment	* Time / hours after challenge											
		Blood (cfu ml ⁻¹ – Blood sample)						Spleen (cfu 0.1 g ⁻¹ – Spleen sample)					
		12 h ^{**}	24 h [`]	48 h [`]	72 h [`]	96 h [`]	240 h [`]	12 h [`]	24 h [`]	48 h [`]	72 h [`]	96 h [`]	240 h [`]
1	Glucan	2.1(±3.4)A x 10 ⁴	3.3(±2.9) x 10 ³	2.8(±4.6) x 10 ³	2.0(±4.1) x 10 ³	2.7(±2.9) x 10 ³	2.5(±3.1) x 10 ³	3.6(±4.2) x 10 ⁶	3.3(±4.6) x 10 ⁶	5.2(±3.9) x 10 ⁶	6.0(±3.3) x 10 ⁵	2.8(±3.1) x 10 ⁵	2.5(±2.9) x 10 ⁵
2	Sodium alginate	1.4(±4.2)B x 10 ⁴	2.6(±3.5) x 10 ³	2.1(±4.5) x 10 ³	1.8(±3.9) x 10 ³	2.5(±1.8) x 10 ³	2(±3.6) x 10 ³	3.9(±5.5) x 10 ⁶	3.2(±4.9) x 10 ⁶	4.3(±3.2) x 10 ⁵	2.2(±4.1) x 10 ⁵	1.9(±2.8) x 10 ⁵	1.5(±2.5) x 10 ⁵
3	Bacterin	3.9(±2.8)C x 10 ³	4.5(±2.7) x 10 ³	4.1(±3.2) x 10 ³	2.1(±4.3) x 10 ³	1.9(±2.2) x 10 ²	1.3(±4.2) x 10 ²	4.1(±4.3) x 10 ⁶	3.4(±4.9) x 10 ⁵	6.3(±5.1) x 10 ⁵	4.5(±2.3) x 10 ⁴	3.9(±5.4) x 10 ⁴	3.3(±4.9) x 10 ⁴
4	Bacterin + glucan	1.4(±1.5)a,b x 10 ³	2.3(±3.5) x 10 ³	6.7(±4.3) x 10 ²	5.5(±3.7) x 10 ²	1.3(±4.2) x 10 ²	1.1(±2.7) x 10 ²	4.2(±2.8) x 10 ⁵	3.5(±4.1) x 10 ⁴	5.4(±5.2) x 10 ⁴	4.4(±4.9) x 10 ⁴	3.1(±2.9) x 10 ⁴	2.8(±3.7) x 10 ⁴
5	Bacterin + sod.alginate	0.6(±0.4)a,c x 10 ³	1.1(±1.0) x 10 ³	4.6(±3.7) x 10 ²	3.9(±5.1) x 10 ²	0.9(±3.3) x 10 ²	0.7(±2.1) x 10 ²	4.4(±4.6) x 10 ⁵	3.7(±2.3) x 10 ⁴	6.3(±3.7) x 10 ⁴	6.1(±4.2) x 10 ⁴	4.5(±3.3) x 10 ⁴	4(±5.5) x 10 ⁴
6	Challenged untreated	4.7(±2.1) a,b,c x 10 ⁴	4.9(±3.3) x 10 ⁴	5.3(±4.1) x 10 ⁵	4.6(±3.8) x 10 ⁵	3.7(±4.6) x 10 ⁵	3.5(±3.9) x 10 ⁵	5.5(±2.7) x 10 ⁶	4.8(±3.2) x 10 ⁶	4.1(±3.7) x 10 ⁶	3.5(±2.7) x 10 ⁷	3.9(±2.8) x 10 ⁷	4.2(±1.9) x 10 ⁷
7	Unchallenged untreated	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Data represented as mean ± S . E . (Standard error).

* A, B, C, Significantly different (P<0.05) from the control groups using least significant difference (LSD).

** h[`] = Hours.

Table (4): Numbers of leukocytes, x 10³/ml of *O.niloticus* fish administered prebiotics and / or bacterin and challenged with *H.alvei*.

Group No.	Treatment	Times per hours *						
		Before challenge	After challenge					
			12 h ^{**}	24 h [`]	48 h [`]	72 h [`]	96 h [`]	240 h [`]
1	Glucan	110 ± 4.2 A	72 ± 5.6	118 ± 6.3	131 ± 1.9	142 ± 3.1	132 ± 4.9	128 ± 6.2
2	Soduim alginate	115 ± 2.7 B	79 ± 4.3	129 ± 4.7	139 ± 6.4	146 ± 5.8	139 ± 2.3	131 ± 4.2
3	Bacterin	120 ± 4.6 C	81 ± 3.7	136 ± 3.3	145 ± 5.2	150 ± 4.5	143 ± 6.6	134 ± 6.1
4	Bacterin + glucan	125 ± 3.3 a,b	88 ± 2.8	142 ± 3.9	155 ± 4.9	161 ± 5.2	152 ± 5.8	145 ± 3.6
5	Bacterin + sod.alginate	130 ± 5.4 a,c	95 ± 4.1	148 ± 2.2	159 ± 2.1	166 ± 6.4	157 ± 3.9	151 ± 4.5
6	Challenged untreated	80 ± 3.6 a,b,c	140 ± 6.5	161 ± 5.9	172 ± 3.9	190 ± 5.2	31 ± 4.7	25 ± 5.6
7	Unchallenged untreated	80 ± 3.6	78 ± 3.3	77 ± 5.5	79 ± 2.4	81 ± 4.2	82 ± 1.9	83 ± 2.1

Data represented as mean ± S . E . (Standard error).

* A, B, C, Significantly different (P<0.05) from the control groups using least significant difference (LSD).

** h[`] = Hours.

Table (5): Number of neutrophils, x 103/ml of *O.niloticus* fish administered prebiotics and / or bacterin and challenged with *H.alvei*.

Group No.	Treatment	Times per hours *						
		Before challenge	After challenge					
			12 h`**	24 h`	48 h`	72 h`	96 h`	240 h`
1	Glucan	9.9 ± 6.3 A	10.3 ± 4.2	11.5 ± 2.7	12.2 ± 4.4	13 ± 3.1	12.1 ± 3.5	11.3 ± 4.2
2	Soduim alginate	10.3 ± 5.6 B	10.9 ± 3.3	12 ± 6.3	13.1 ± 2.8	14.3 ± 4.5	13.5 ± 3.7	12.7 ± 3.4
3	Bacterin	11.1 ± 3.9 C	11.8 ± 5.5	13.1 ± 6.7	14.3 ± 5.1	15.5 ± 3.9	14.6 ± 5.5	13.3 ± 2.7
4	Bacterin + glucan	11.9 ± 4.8 a,b	12.5 ± 1.5	14.2 ± 4.8	15.2 ± 1.8	16.4 ± 6.5	15.5 ± 2.2	14.1 ± 5.4
5	Bacterin + sod.alginate	12.3 ± 3.5 a,c	12.8 ± 5.2	14.9 ± 3.9	16.2 ± 5.3	17.1 ± 2.1	16.3 ± 4.3	15.8 ± 3.9
6	Challenged untreated	7.3 ± 4.2a,b,c	6.5 ± 5.2	6.9 ± 4.3	7.2 ± 3.9	8.5 ± 5.7	9.7 ± 4.3	8.8 ± 5.5
7	Unchallenged untreated	7.3 ± 4.2	5.2 ± 2.1	4.6 ± 4.2	4.1 ± 3.2	3.8 ± 5.9	8.5 ± 6.5	7.9 ± 2.8

Data represented as mean ± S . E . (Standard error).

* A , B , C , Significantly different (P<0.05) from the control groups using least significant difference (LSD).

** h` = Hours.

Table (6): Number of monocytes, $\times 10^3/\text{ml}$ of *O.niloticus* fish administered prebiotics and / or bacterin and challenged with *H.alvei*.

Group No.	Treatment	Times per hours *						
		Before challenge	After challenge					
			12 h`**	24 h`	48 h`	72 h`	96 h`	240 h`
1	Glucan	6.2 \pm 5.1 A	3.5 \pm 4.9	15.5 \pm 6.7	18.6 \pm 1.8	11.5 \pm 2.4	6.9 \pm 3.8	6.3 \pm 5.5
2	Sodium alginate	6.7 \pm 6.3 B	3.7 \pm 5.2	17.3 \pm 4.9	19.9 \pm 4.5	13.3 \pm 5.2	7.3 \pm 4.5	7.5 \pm 3.1
3	Bacterin	7.3 \pm 3.4 C	4.1 \pm 5.8	18.5 \pm 4.3	21.2 \pm 3.3	14.6 \pm 6.2	7.7 \pm 3.6	8 \pm 4.1
4	Bacterin + glucan	7.6 \pm 3.9 a,b	4.3 \pm 4.1	19.6 \pm 2.2	23.5 \pm 4.9	16.3 \pm 6.1	8.9 \pm 1.8	9.3 \pm 4.2
5	Bacterin + sod.alginate	7.9 \pm 4.7 a,c	4.5 \pm 5.5	20.2 \pm 5.8	25.7 \pm 1.9	17.1 \pm 4.4	9.7 \pm 6.3	10.2 \pm 5.5
6	Challenged untreated	5.3 \pm 2.7 a,b,c	5 \pm 3.8	4.6 \pm 5.5	4.2 \pm 4.4	3.9 \pm 6.3	3.8 \pm 2.8	4.3 \pm 3.6
7	Unchallenged untreated	5.3 \pm 2.7	5.1 \pm 4.7	4.9 \pm 3.8	4.7 \pm 3.9	4.6 \pm 4.3	4.7 \pm 5.5	5.1 \pm 1.1

Data represented as mean \pm S . E . (Standard error).

* **A, B, C**, Significantly different ($P < 0.05$) from the control groups using least significant difference (LSD).

** **h`** = Hours.

Table (7): Number of glass - adherent NBT -positive cells, x 10³/ml of *O.niloticus* fish administered prebiotics and / or bacterin and challenged with *H.alvei*. 77

Group No.	Treatment	Times per hours *						
		Before challenge	After challenge					
			12 h`**	24 h`	48 h`	72 h`	96 h`	240 h`
1	Glucan	18.7 ± 6.3 A	18.9 ± 5.5	19.2 ± 6.6	20.2 ± 4.5	21.4 ± 5.1	21.6 ± 4.8	20.1 ± 2.2
2	Soduim alginate	24.9 ± 5.7 B	25.3 ± 6.4	26.3 ± 5.5	28.2 ± 6.1	29.3 ± 4.2	29.7 ± 5.9	28.3 ± 4.6
3	Bacterin	34.5 ± 6.5 C	35.9 ± 5.9	36.1 ± 6.2	37.5 ± 7.2	38.2 ± 5.5	38.8 ± 6.5	37.5 ± 5.5
4	Bacterin + glucan	39.1 ± 5.8 a,b	39.9 ± 6.7	40.3 ± 5.9	41.2 ± 6.4	42.8 ± 7.2	42.9 ± 6.1	40.8 ± 5.9
5	Bacterin + sod.alginate	41.5 ± 7.5 a,c	42.2 ± 6.3	43.7 ± 8.5	44.4 ± 4.5	45.7 ± 6.4	46.8 ± 5.4	48.5 ± 3.3
6	Challenged untreated	2.5 ± 1.5a,b,c	2.5 ± 1.5	2.3 ± 1.2	2.1 ± 1.3	3.0 ± 1.1	3.6 ± 2.5	4.8 ± 5.4
7	Unchallenged untreated	2.5 ± 1.5	2.5 ± 1.5	2.5 ± 1.5	2.5 ± 1.5	2.5 ± 1.5	2.5 ± 1.5	2.5 ± 1.5

Data represented as mean ± S . E . (Standard error).

* A, B, C, Significantly different (P<0.05) from the control groups using least significant difference (LSD).

** h` = Hours.

Table (8): Phagocytosis ratio, % of *O.niloticus* fish administered prebiotics and /or bacterin and challenged with *H.alvei*.

Group No.	Treatment	Times per hours *						
		Before challenge	After challenge					
			12 h`**	24 h`	48 h`	72 h`	96 h`	240 h`
1	Glucan	5.4 ± 3.1 A	3.3 ± 4.8	11.1 ± 3.7	15.1 ± 5.6	16.9 ± 6.3	15.2 ± 2.3	14 ± 5.5
2	Sodium alginate	5.6 ± 4.2 B	3.5 ± 5.4	12.3 ± 3.7	15.9 ± 6.1	17.4 ± 5.7	15.5 ± 5.4	14.4 ± 2.3
3	Bacterin	6.1 ± 4.5 C	3.9 ± 6.8	14.6 ± 6.2	17.5 ± 6.6	19.5 ± 6.1	17.8 ± 3.4	16.1 ± 1.7
4	Bacterin + glucan	6.3 ± 6.1 a,b	4.1 ± 3.9	15.4 ± 5.9	18.9 ± 3.3	20.3 ± 4.7	18.5 ± 6.5	17.5 ± 3.9
5	Bacterin + sod.alginate	6.8 ± 5.5 a,c	4.4 ± 4.3	17.7 ± 3.3	20.5 ± 2.9	22.7 ± 3.5	20.1 ± 4.9	18.8 ± 6.4
6	Challenged untreated	6.6 ± 3.2a,b,c	4.3 ± 1.8	6.5 ± 2.9	7.7 ± 5.5	9.3 ± 2.2	9.9 ± 4.3	9.5 ± 3.7
7	Unchallenged untreated	6.6 ± 3.2	5.1 ± 4.1	5.5 ± 4.3	6.7 ± 4.7	7.3 ± 3.9	8.2 ± 6.2	7.9 ± 5.8

Data represented as mean ± S . E . (Standard error).

* A, B, C, Significantly different (P<0.05) from the control groups using least significant difference (LSD).

**h`=Hours.