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The protective beneficial role of Dandelion (Taraxacum) Methanolic Extract on Kidney Function in STZ-Induced Diabetic affected Rats: accouterments on Selected Metabolic Markers

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Objectives:

Present outcomes Dandelion (*Taraxacum*) possesses ant- hyperglycemic effects. The effects of *Taraxacum* on diabetic complications such as DN, however, have not been established. Accordingly, this study seeks to investigate the effects of *Taraxacum* on kidney function in STZ-induced diabetic rats.

Methods:

Methanolic extracts (ME) of *Taraxacum* root were used in this study. Short-term effects of *Taraxacum* methanolic extract on kidney function and MAP were studied in STZ-induced diabetic rats treated twice daily with *Taraxacum* methanolic root extract (250 mg/kg), insulin (175 μg/kg, s.c.), and metformin (500 mg/kg) for 5 weeks.

Results: *Taraxacum* methanolic root extract appreciably increased Na^+ excretion outputs in STZ-induced diabetic rats by comparison to STZ-diabetic regulate rats. *Taraxacum* methanolic extract significantly increased GFR in STZ-diabetic rats with a concomitant decrease in creatinine concentration and also reduced kidney-to-body ratio, albumin excretion rate (AER), and albumin creatinine ratio (ACR). *Taraxacum* methanolic extract appreciably reduced MAP in STZ-diabetic rats by comparison with STZ-diabetic control rats. These results suggest that *Taraxacum* methanolic root extract not only lowers blood glucose but also has beneficial effects on blood pressure and renal function

Conclusions:

These observations propose that *Taraxacum* may have beneficial effects on some processes that are associated with renal derangement in STZ-induced diabetic rats.

TABLE 1: Comparison of food, water intake, and body weight (b.wt) change of nondiabetic controls (NC), diabetic controls (DC), and diabetic rats treated with Traxacum(TC) , metformin, and insulin during a 5-week study ($n = 6$ in each group). Values are expressed as mean ± SEM.

Parameter	Treatment	Time (weeks)				
		1	2	3	4	5
Food intake (g/100 g)	NC	11.9 ± 3.4	12.2 ± 1.6	12.3 ± 1.7	13.0 ± 0.4	12.9 ± 0.9
	DC	27.6 ± 1.2	25.4 ± 1.4	16.7 ± 0.4	28.0 ± 1.1	24.8 ± 0.3
	TC	10.0 ± 2.1*	10.2 ± 2.6*	16.4 ± 1.1	26.47 ± 2.4*	18.9 ± 0.6
	INS	19.2 ± 2.2*	18.8 ± 1.9*	11.2 ± 0.8	15.5 ± 3.0*	14.2 ± 0.9*
	MTF	28.2 ± 0.6*	22.7 ± 0.5	21.8 ± 0.5	19.8 ± 0.7	26.8 ± 1.7
Water intake (mL/100 g)	NC	30 ± 8.2	35 ± 1.4	32.5 ± 8.5	45 ± 9.6	51.2 ± 7.2
	DC	60 ± 9.6	61.3 ± 12.9	95.0 ± 3.7	91.3 ± 3.4	96 ± 1.0
	TC	72.5 ± 2.5	67.0 ± 4.1	73.8 ± 8.3	78.7 ± 9.6	76 ± 1.0
	INS	73.0 ± 4.4	76.3 ± 9.4	76.3 ± 0.1	76.4 ± 4.8	74.2 ± 2.3
	MTF	68.8 ± 3.1	41.3 ± 7.5	45.6 ± 2.5	45.2 ± 2.3	43.8 ± 1.1
% b.wt change/week	NC	44.7 ± 9.4	69.7 ± 5.9	76 ± 8.6	90.7 ± 11.1	92.5 ± 9.9
	DC	−72 ± 8.6	−87.2 ± 20	−77.5 ± 9.8	−77.5 ± 12	−80 ± 7.4
	TC	−13.8 ± 8*	−11.1 ± 5*	−19.5 ± 6.2*	−15.3 ± 6.1*	−40.5 ± 11
	INS	18.5 ± 13.9*	3.2 ± 15.7*	30.0 ± 16.2*	38.3 ± 18.1*	28.3 ± 3.2*
	MTF	−23 ± 7.3	−6 ± 6.8	−32 ± 2.9	−11 ± 17.3	−37 ± 3.2
Glucose (mmol/L)	NC	5.1 ± 0.3	5.1 ± 0.4	4.9 ± 0.3	5.8 ± 0.5	5.3 ± 0.1
	DC	33.1 ± 1.5#	33.1 ± 0#	33.4 ± 0.2#	33.0 ± 0.8#	33.2 ± 0.2#
	TC	27.2 ± 0.3	29.1 ± 0.3	24.2 ± 1.9*	25.6 ± 0.6*	26.4 ± 1.0*
	INS	30.7 ± 0.8	23.2 ± 2.6	21.1 ± 2.3*	21.9 ± 1.6*	17.1 ± 0.9*
	MTF	28.0 ± 2.1	26.0 ± 1.4	25.7 ± 0.5*	24.6 ± 0.9*	24.8 ± 0.6*

#$p < 0.05$ by comparison with nondiabetic control and *$p < 0.05$ by comparison with diabetic control.

Table:2 Comparison of plasma biochemical parameters and urinary electrolytes of nondiabetic controls, diabetic controls, and diabetic rats treated with Traxacum (TC), metformin, and insulin during a 5-week study ($n = 6$ in each group). Values are expressed as mean ± SEM.

Parameters	Groups				
	NC	DC	TC	INS	MTF
Urinary Na^+ (mmol/L)	66.8 ± 1.2	42.3 ± 3.5#	53.7 ± 1.3*	38.2 ± 1.2	66.0 ± 2.9*
Plasma Na^+ (mmol/L)	120.3 ± 3.3	134.0 ± 2.0#	121.5 ± 4.2*	133.2 ± 1.3	121.7 ± 1.4*
Urinary K^+ (mmol/L)	45.5 ± 1.7	25.5 ± 2.1#	53.7 ± 1.3*	38.2 ± 3.3*	55.5 ± 4.1*
Plasma K^+ (mmol/L)	9.9 ± 1.3	7.6 ± 0.6#	7.9 ± 0.3	9.5 ± 0.7*	8.4 ± 0.4*
Urinary urea (mmol/L)	654.3 ± 6.8	117.8 ± 4.8#	315.3 ± 5.8*	356 ± 9.9*	351 ± 8.0*
Plasma urea (mmol/L)	4.9 ± 0.3	17.5 ± 1.3#	7.0 ± 0.6*	7.6 ± 0.8*	6.4 ± 0.9*
Urinary albumin (g/L)	1.7 ± 0.2	3.5 ± 0.4#	3.2 ± 0.7	4.2 ± 0.7*	4.7 ± 1.1*
Plasma albumin (g/L)	16.5 ± 1.0	12.3 ± 0.6#	13.2 ± 0,6	14.3 ± 0.7*	14.3 ± 1.3*
Urinary creatinine (μmol/L)	9.9 ± 0.7	14.9 ± 0.3#	10.4 ± 0.2*	8.1 ± 0.4*	10.8 ± 0.2*
Creatinine (μmol/L)	32.5 ± 1.3	45.8 ± 1.1#	29.8 ± 1.0*	34.8 ± 1.9*	28.2 ± 0.8*
Aldosterone (pg/mL)	0.2 ± 0.02	0.4 ± 0.1#	0.3 ± 0.4*	0.4 ± 0.2	0.2 ± 0.1*

#$p < 0.05$ by comparison with nondiabetic control; *$p < 0.05$ by comparison with diabetic control.

TABLE 3: Effects of Traxacum (TC) on the kidney-to-body weight ratio after a 5-week study ($n = 6$ in each group). Values are expressed as mean ± SEM.

Experimental groups	Final body weight (g)	Kidney weight (g)	Kidney : body weight ratio (%)
NC	342.5 ± 9.92	1.11 ± 0.081	0.32 ± 0.02
DC	170 ± 7.39#	1.37 ± 0.09#	0.80 ± 0.02#
TC	209 ± 11.33*	1.01 ± 0.031*	0.53 ± 0.03'
INS	278.5 ± 7.5'	1.14 ± 0.14*	0.41 ± 0.06'
MTF	212.5 ± 0.04'	0.97 ± 0.40*	0.46 ± 0.023'

#$p < 0.05$ by comparison with nondiabetic control; *$p < 0\ 05$ by comparison with diabetic control.

TABLE 4: Comparison albumin excretion rate (AER), albumin creatinine ratio (ACR), and glomerular filtration rate (GFR) of nondiabetic controls, diabetic controls, and diabetic rats treated with Traxacum (TC), metformin, and insulin rats after a 5-week study ($n = 6$ in each group). Values are expressed as mean ± SEM.

Parameters	Groups				
	NC	DC	TC	INS	MTF
AER (mg/day)	0.024 ± 0.01	0.29 ± 0.03#	0.17 ± 0.01*	0.15 ± 0.01*	0.19 ± 0.03'
ACR	8.10 ± 013	27.03 ± 1.13#	15.72 ± 1.50*	13.48 ± 0.84*	19.23 ± 0.28'
GFR (mL/min/100 g)	33.5 ± 0.5	24.8 ± 1.3#	33.7 ± 1.5*	37.9 ± 1.3*	30.9 ± 2.1*

#$p < 0\ 05$ by comparison with nondiabetic control; *$p < 0\ 05$ by comparison with diabetic control.

TABLE 5: Effects of TC on MDA concentrations and activities of SOD and GPx in kidney tissues of non-diabetic controls, diabetic controls, and diabetic rats treated with TC, metformin, and insulin. Values are expressed as mean ± SEM.

Parameter measured	Treatment	Kidney
MDA (nmol·g^{-1} protein)	NC	0.994 ± 0.020
	DC	4.21 ± 0.12#
	INS	1.1 ± 0.01*
	MTF	1.19 ± 0.01'
	TC	1.14 ± 0.01'
SOD activity (pg/mL)	NC	13.43 ± 0.76
	DC	6.01 ± 0.09#
	INS	9.89 ± 0.10'
	MTF	10.11 ± 0.02'
	TC	10.08 ± 0.05'
GPx activity (ng/mL)	NC	2137.31 ± 0.03
	DC	1703.491 ± 0.03#
	INS	2062.21 ± 0.02'
	MTF	2125.75 ± 0.01'
	TC	21370.37 ± 0.03*

#$p < 0\ 05$ by comparison with nondiabetic control; *$p < 0\ 05$ by comparison with diabetic control