msu management & science university

Conjunction with

Natural TONE

& the following Departments:

UPM Universiti Putra Malaysia

Forest Research Institute Malaysia FRIM

RESEARCH

Potential Effects Potential effects on a combination of Zinger officinale, Allium sativum, Citrus lemon, honey, and Malus domestica vinegar (ZACA) extract in rats fed with high cholesterol diet

Conclusion

The results demonstrate that ZACA extracts have a hyperlipidemic activity that can be an alternative approach to combat hyperlipidemia complications.

Research by:

Kokila Vani Perumal1, 2 , Kasturi Kanniappan2 , Hasnah Bahari1* , Khairul Kamilah Abdul kadir3 , Zunoliza Abdullah4 , Mohd Radzi Ahmad5 , NorShafarina Shari2 , Ibrahim Kalle Kwaifa6 , Azrina Zainal Abidin1, 2 , Sabariah Md Noor6 , Santhra Segaran Balan1, 2*

1 Department Human Anatomy, Faculty Medicine and Health Sciences, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia.
2 Department of Diagnostic and Allied Health Sciences, Faculty of Health and Life Sciences, 40100 Shah Alam, Selangor, Malaysia.
3 Cawangan Inkubasi Teknologi, Bahagian Inovasi dan Komersialisasi, Institut Penyelidikan Perhutanan Malaysia (FRIM), 52109 Kepong, Selangor.
4 Natural Products Division, FRIM, 52109 Kepong, Selangor.
5 Products Division, FRIM, 52109 Kepong, Selangor.
6 Department of Pathology, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia (UPM), Selangor 43400, Malaysia

RESEARCH METHOD

1. **Testing the outcome of 6 group of samples**
2. **6 groups:**
   - **NC** – *Normal chow diet*
   - **PC** – *High cholesterol diet*
   - **DC** – *High cholesterol diet, simvastatin control cholesterol*
   - **WD1** – *High cholesterol diet, consuming WD6 1mg/kg, or equivalent to **6ml** for human*
   - **WD2** – *High cholesterol diet, consuming WD6 3mg/kg, or equivalent to **18ml** for human*
   - **WD3** – *High cholesterol diet, consuming WD6 5mg/kg, or equivalent to **30ml** for human*
3. Except NC group, the food intake for the rest are the same
4. For the period of 18 weeks continuously.

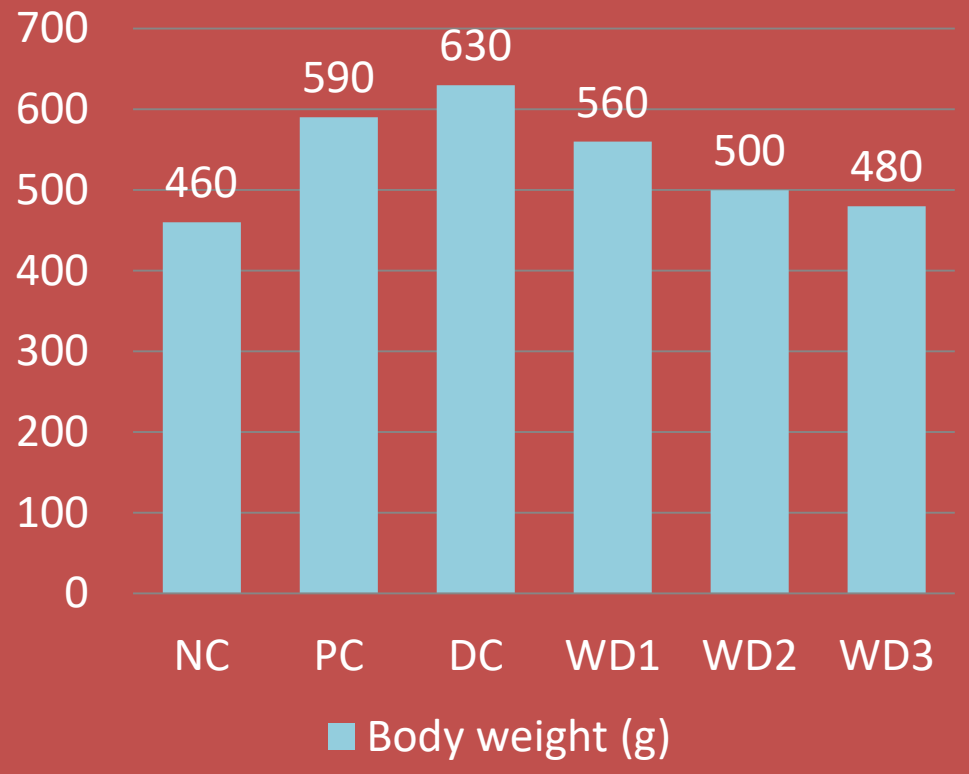
msu
management & science university

Compare between group:
PC (High Cholesterol Diet)
&
WD3 (same intake, take Wonderdrink[6] also)

Body weight reduced by:

18.64%

BODY WEIGHT COMPARISON RESULT



(Results based on 18 weeks data experiments)

msu management & science university

Compare between group:

PC (High Cholesterol Diet)

&

WD3 (same intake, but take Wonderdrink[6] also)

Belly Fat (RpWAT) reduced by:

77.8%

Viseral Fat reduced by:

66.4%

ORGAN WEIGHT COMPARISON RESULT

Group	Organ Weight (g)				
	Liver	Adipose Tissue		Total WAT	Kidney
		RpWAT	Visceral fat		
NC	14.69 ± 0.76c	6.00 ± 1.62e,f	1.95 ± 0.87	12.98 ± 2.79k,l	2.99 ± 0.18n
PC	15.95 ± 0.85c	14.49 ± 1.24d	2.89 ± 0.86	26.05 ± 2.93j	3.24 ± 0.14
DC	19.17 ± 1.43a,b	19.39 ± 3.19d	3.51 ± 1.21h,i	33.77 ± 3.97j	3.57 ± 0.22m
WD1	15.83 ± 1.02c	5.37 ± 1.23e,f	1.83 ± 0.45	13.09 ± 2.44k,l	3.19 ± 0.29
WD2	14.88 ± 0.57c	3.81 ± 1.11e,f	1.01 ± 0.30g	9.84 ± 2.27k,l	3.14 ± 0.17
WD3	14.20 ± 1.23c	3.21 ± 1.25e,f	0.97 ± 0.77g	7.62 ± 0.89k,l	3.02 ± 0.10

(Results based on 18 weeks data experiments)

msu management & science university

Compare between group:
PC (High Cholesterol Diet)
&
WD3 (same intake, but take Wonderdrink[6] also)

Bad cholesterol (LDL) reduced by:

37.8%

Triglycerides (TG) reduced by:

27.3%

ORGAN WEIGHT COMPARISON RESULTS

Group	LIPID PROFILE (mmok/L)			
	Total Cholesterol	High Density Cholesterol	Low Density Cholesterol	triglycerides
NC	1.75 ± 0.06b,d	0.48 ± 0.04g	0.75 ± 0.13i,j	1.10 ± 0.23
PC	2.47 ± 0.06a,c	0.40 ± 0.04	1.48 ± 0.18h	1.28 ± 0.23
DC	2.02 ± 0.13b	0.3 ± 0.03e	1.23 ± 0.15h	1.05 ± 0.17
WD1	2.27 ± 0.13a	0.60 ± 0.06f,g	1.03 ± 0.15	1.45 ± 0.26
WD2	2.17 ± 0.07a	0.58 ± 0.04f,g	0.80 ± 0.20i	1.73 ± 0.45l
WD3	1.85 ± 0.14b,d	0.52 ± 0.05g	0.92 ± 0.14i	0.93 ± 0.22k

(Results based on 18 weeks data experiments)

msu management & science university

Compare between group:
PC (High Cholesterol Diet)
&
WD3 (same intake, but take Wonderdrink[6] also)

Creatinine reduced by:

16.6%

AST reduced by:

46.9%

ALT reduced by:

80.2%

LIVER ENZYME COMPARISON RESULTS

GROUP	BLOOD TOXICITY		
	Creatinine (umol/L)	AST (U/L)	ALT (U/L)
NC	25.83 ± 1.99	176.17 ± 41.60	66.50 ± 16.19
PC	29.00 ± 1.75b,c	183.17 ± 70.55	111.83 ± 54.36
DC	24.33 ± 2.14	107.00 ± 18.57	35.17 ± 12.25
WD1	24.50 ± 1.65a	157.17 ± 33.90	32.83 ± 7.66b
WD2	24.67 ± 1.28	100.67 ± 20.12	50.50 ± 29.30
WD3	24.17 ± 0.54a	97.17 ± 8.91	22.83 ± 2.36b

(Results based on 18 weeks data experiments)