

## **Potential effects of rapeseed peptides Maillard reaction products on aging-related disorder attenuation and gut microbiota modulation in D-galactose induced aging mice**

Shudong He <sup>a,b,c,1</sup>, Zuoyong Zhang <sup>a,1</sup>, Hanju Sun <sup>a,c,\*</sup>, Yuchen Zhu <sup>d</sup>, Xiaodong Cao <sup>a,c</sup>, Yongkang Ye <sup>a,c</sup>, Junhui Wang <sup>a,c</sup>, Yanping Cao <sup>b,\*\*</sup>

<sup>a</sup> School of Food and Biological Engineering, Engineering Research Center of Bio-process of Ministry of Education, Hefei University of Technology, Hefei 230009, Anhui, China

<sup>b</sup> Beijing Advanced Innovation Center for Food Nutrition and Human Health, Beijing Technology and Business University (BTBU), Beijing 100048, China

<sup>c</sup> Anhui Province Key Laboratory of Functional Compound Seasoning, Anhui Qiangwang Seasoning Food Co., Ltd., Jieshou 236500, Anhui, China

<sup>d</sup> College of Food Science and Nutritional Engineering, China Agricultural University, Beijing 100083, China

<sup>1</sup> means the co-first authors.

\* Correspondence to : H. Sun, . Hefei University of Technology, Hefei 230009, Anhui, China. Email: [sunhanjv@yeah.net](mailto:sunhanjv@yeah.net)

\*\* Correspondence to : Y. Cao, . Beijing Technology and Business University (BTBU), Beijing 100048, China. Email: [caoy@th.btbu.edu.cn](mailto:caoy@th.btbu.edu.cn)

**Table S1A** Changes of urine fluorescence intensity in mice fed with different diets during the 6 experimental weeks.

Group	Urine fluorescence intensity (AU)						
	0 week	1st week	2nd week	3rd week	4th week	5th week	6th week
AC	200.42±2.04A,g	210.10±1.56B,f	218.44±4.29C,e	228.88±2.41D,d	235.92±2.35D,c	242.77±3.11D,b	251.40±1.76D,a
NC	185.79±1.76B,f	194.24±2.14D,e	196.93±2.76D,de	201.28±3.63F,c d	204.42±3.07F,c	210.60±1.85F,b	215.41±1.91F,a
DG	184.82±3.48B,e	195.27±2.19D,d	199.38±3.21D,d	206.25±3.11E,c	209.66±2.21E,c	214.68±1.54E,b	225.05±1.59E,a
LMRPs	183.44±3.09B,g	203.09±1.76C,f	222.59±2.42C,e	259.07±2.51C,d	266.87±2.30C,c	289.39±1.58C,b	306.53±2.32C,a
MMRPs	183.93±4.38B,g	212.73±2.71B,f	236.09±1.60B,e	266.10±1.77B,d	281.67±2.48B,c	308.81±1.74B,b	320.15±3.12B,a
HMRPs	184.79±3.23B,g	227.36±2.22A,f	248.80±2.76A,e	285.34±1.81A,d	308.83±3.09A,c	329.36±1.09A,b	357.34±2.31A,a

The highest and lowest values of urine fluorescence intensity were removed prior to the average. Results are expressed as the mean ± standard deviation (n = 6-8/group). Values followed by different capital letters in the same column mean statistically significant differences ( $p < 0.05$ ) among different treated groups. Values followed by different lowercase letters in the same line mean statistically significant differences ( $p < 0.05$ ) in a same group among the different experimental weeks.

**Table S1B** Changes of fecal color in mice fed with different diets during the 6 experimental weeks.

Time (week)	Fecal color						
	AC	NC	DG	LMRPs	MMRPs	HMRPs	
0	<i>L</i> *	52.55±0.76B,a	61.78±1.63A,a	62.30±0.58A,a	62.44±1.05A,a	62.25±1.73A,a	62.77±1.33A,a
	<i>a</i> *	2.72±0.37A,e	1.86±0.16B,e	2.11±0.16B,f	2.02±0.17B,g	2.05±0.10B,g	1.99±0.24B,g
	<i>b</i> *	12.40±0.22A,e	8.37±0.22B,f	8.21±0.25B,f	8.75±0.48B,g	8.50±0.38B,g	8.39±0.31B,g
1	<i>L</i> *	51.72±0.88B,ab	60.87±1.81A,ab	59.91±0.82A,ab	54.86±2.55B,b	54.26±2.32B,b	52.31±2.08B,b
	<i>a</i> *	2.92±0.21B,de	2.04±0.18D,de	2.39±0.15C,ef	2.99±0.15B,f	3.18±0.18B,f	3.87±0.16A,f
	<i>b</i> *	12.99±0.37A,de	8.89±0.25D,e	8.81±0.24D,e	10.46±0.31C,f	11.62±0.44B,f	12.57±0.49A,f
2	<i>L</i> *	50.84±1.30B,abc	60.14±1.9A,ab	59.14±1.13A,b	51.02±1.80B,c	49.23±1.67BC,c	47.63±1.57C,c
	<i>a</i> *	3.06±0.25D,de	2.32±0.21E,d	2.74±0.28DE,de	4.05±0.21C,e	4.75±0.33B,e	5.62±0.37A,e
	<i>b</i> *	13.48±0.35B,d	9.36±0.21D,de	9.78±0.23D,d	12.58±0.28C,e	13.67±0.43B,e	15.42±0.39A,e
3	<i>L</i> *	50.26±1.64B,abc	59.34±1.17A,ab	58.34±1.65A,bc	48.75±1.96BC,cd	46.20±2.71CD,cd	44.65±1.86D,cd
	<i>a</i> *	3.43±0.35D,cd	2.67±0.23E,c	3.01±0.23DE,cd	4.67±0.25C,d	5.69±0.22B,d	6.65±0.26A,d
	<i>b</i> *	14.13±0.36C,c	9.83±0.31F,d	10.69±0.31E,c	13.39±0.20D,d	15.69±0.35B,d	17.33±0.28A,d
4	<i>L</i> *	49.77±0.77B,bc	58.83±1.16A,ab	57.73±2.33A,bcd	47.12±1.25BC,de	44.38±2.29CD,d	42.17±1.75D,de
	<i>a</i> *	3.88±0.36D,bc	3.08±0.24E,b	3.22±0.22E,c	5.11±0.22C,c	6.22±0.34B,c	7.60±0.34A,c
	<i>b</i> *	14.73±0.28Cb	10.32±0.33E,c	11.76±0.39D,b	14.44±0.38C,c	16.79±0.22B,c	18.45±0.46A,c
5	<i>L</i> *	49.37±1.77B,bc	58.26±2.09A,b	56.17±1.31A,cd	45.28±2.07C,ef	43.42±2.12CD,de	40.35±1.65D,ef
	<i>a</i> *	4.24±0.33D,ab	3.42±0.19E,b	3.61±0.25E,b	5.98±0.27C,b	6.92±0.23B,b	8.83±0.27A,b
	<i>b</i> *	15.27±0.37D,ab	10.81±0.27F,b	12.02±0.41E,b	16.52±0.32C,b	17.43±0.26B,b	19.58±0.33A,b
6	<i>L</i> *	48.58±1.34F,c	57.93±2.18E,b	55.25±1.61D,d	42.87±2.12C,f	40.52±1.43B,e	37.69±1.99A,f
	<i>a</i> *	4.75±0.26D,a	3.88±0.17E,a	4.02±0.15E,a	6.53±0.34C,a	7.88±0.31B,a	9.95±0.22A,a
	<i>b</i> *	15.84±0.39D,a	11.46±0.31F,a	12.60±0.32E,a	17.90±0.29C,a	18.58±0.33B,a	20.64±0.31A,a

The highest and lowest values of fecal color were removed prior to the average. Results are expressed as the mean ± standard deviation (n = 6-8/group). Values followed by different capital letters in the same column mean statistically significant differences ( $p < 0.05$ ) among different treated groups. Values followed by different lowercase letters in the same line mean statistically significant differences ( $p < 0.05$ ) in a same group among the different experimental weeks.

**Table S2** Protein contents of serum, liver, kidney and brain in mice fed with different diets during the 6 experimental weeks.

Group	Protein content (gprot/L)			
	Serum	Liver	Kidney	Brain
AC	48.61±1.84b	14.87±0.22bc	11.06±0.56b	2.07±0.41b
NC	57.75±2.58a	15.92±0.25a	12.28±0.95a	3.13±0.35a
DG	48.58±2.79b	14.51±0.44c	11.04±0.71b	2.10±0.16b
LMRPs	49.19±1.80b	14.99±0.72b	11.26±0.45b	2.47±0.36b
MMRPs	54.80±2.11a	15.61±0.76a	11.57±0.99ab	2.88±0.38a
HMRPs	56.26±2.61a	15.80±0.51a	11.70±0.78a	2.92 ±0.52a

The highest and lowest values of protein content were removed prior to the average. Results are expressed as the mean ± standard deviation (n = 6-8/group). Values followed by different lowercase letters in the same column mean statistically significant differences ( $p < 0.05$ ) among different treated groups.

**Table S3** Serum antioxidant capacities of mice in different treated groups

Group	Serum antioxidant capacity				
	CAT (U/ml)	T-AOC (Unit/ml)	SOD (U/ml)	GSH-PX (U/ml)	MDA (nmol/ml)
AC	3.85±0.56cd	4.56±0.52b	85.26±1.03d	583.62±2.14f	6.03±0.23b
NC	7.68±0.34a	8.18±0.53a	113.72±1.33a	744.28±2.60a	2.39±0.19f
DG	3.53±0.27d	4.41±0.37b	83.39±0.85e	589.34±2.31e	6.50±0.20a
LMRPs	4.45±0.43c	5.03±0.48b	86.51±0.96d	604.68±2.16d	5.65±0.16c
MMRPs	6.01±0.43b	6.82±0.71 a	95.06±0.64c	663.69±2.86c	4.68±0.22d
HMRPs	6.73±0.26b	7.19±1.31a	99.50±0.94b	686.31±2.55b	3.95±0.13e

The highest and lowest values of serum antioxidant capacity were removed prior to the average. Results are expressed as the mean ± standard deviation (n = 6-8/group). Values followed by different lowercase letters in the same column mean statistically significant differences ( $p < 0.05$ ) among different treated groups.