THE 14th INTERNATIONAL CONGRESS OF
ENDOCRINE DISORDERS
22nd - 24th November 2023

Assessment of the anti-inflammatory and anti-glycemic properties of Royal Jelly and Tocotrienol-rich fraction in an experimental study: Does irisin mediate these effects?

Presented by:

Dr. Naimeh Mesri Alamdari

Endocrine Research Center, Tabriz University Of Medical Science

Introduction

Obesity is defined as an extension of adipose tissue mass

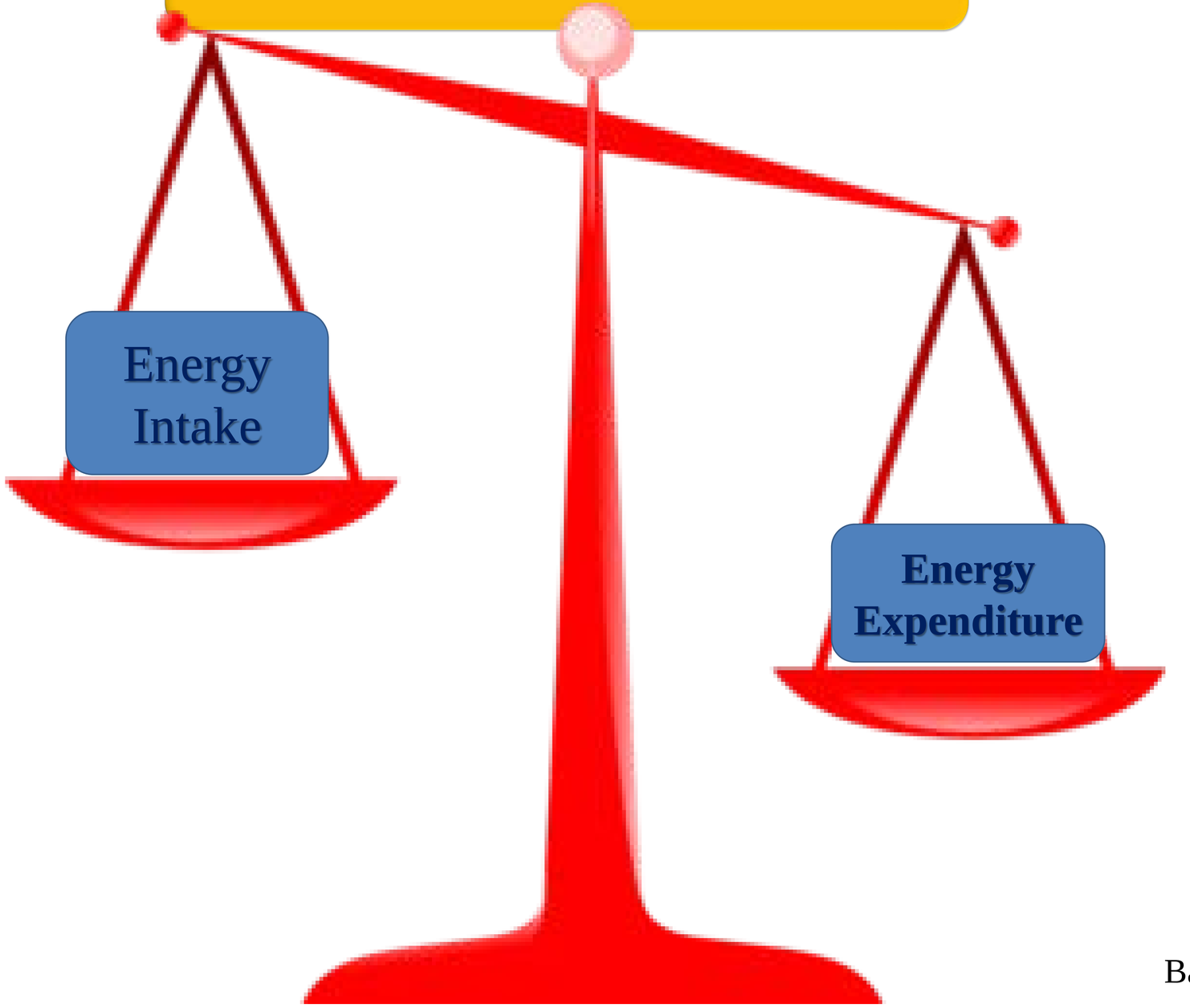
Inflammatory State

Oxidative stress

Insulin Resistance

Kinlen, Cody and O'Shea 2018

Etiology



Barquissau V, et al.2016

Management

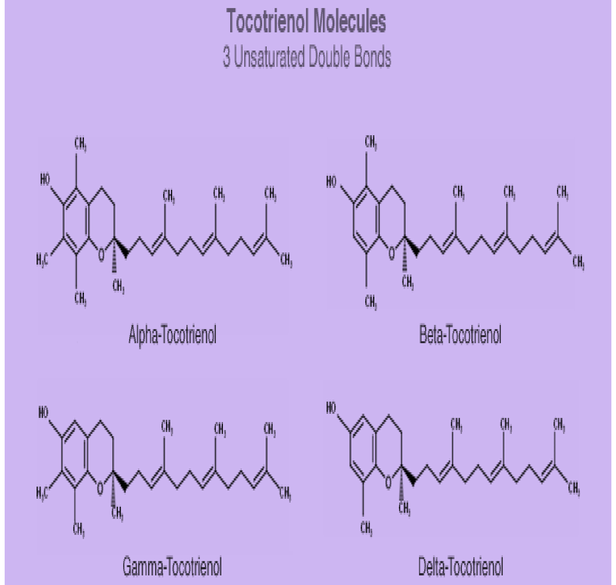
- Calorie restriction → The primary intervention in obesity management.
- Inefficient approach in long-term.
- Metabolic adaptations occur in response to energy limitation including: reductions in thermogenesis, resting energy expenditure or other constituents.

Nakhuda A et al, 2016

Royal Jelly(RJ)

- Royal Jelly (RJ) yellowish-white, multifunctional creamy material product of honey bees
- Hypoglycemic, antihypercholesterolemia, antitumor, anti-inflammatory, hypotensive, antioxidant, antimicrobial and antiaging characteristics.
- The main components of RJ are 2 fatty acids: → 10-hydroxy-Trans- 2-decenoic acid (HDEA)and Hydroxy decanoic acid (HDAA)
- RJ ameliorate obesity → elevate the UCP1 expression, increase thermogenesis produce beige adipose tissue (white fat browning effect)

Pavel, Mărghitaş et al. 2011, Ahmad, Campos et al. 2020

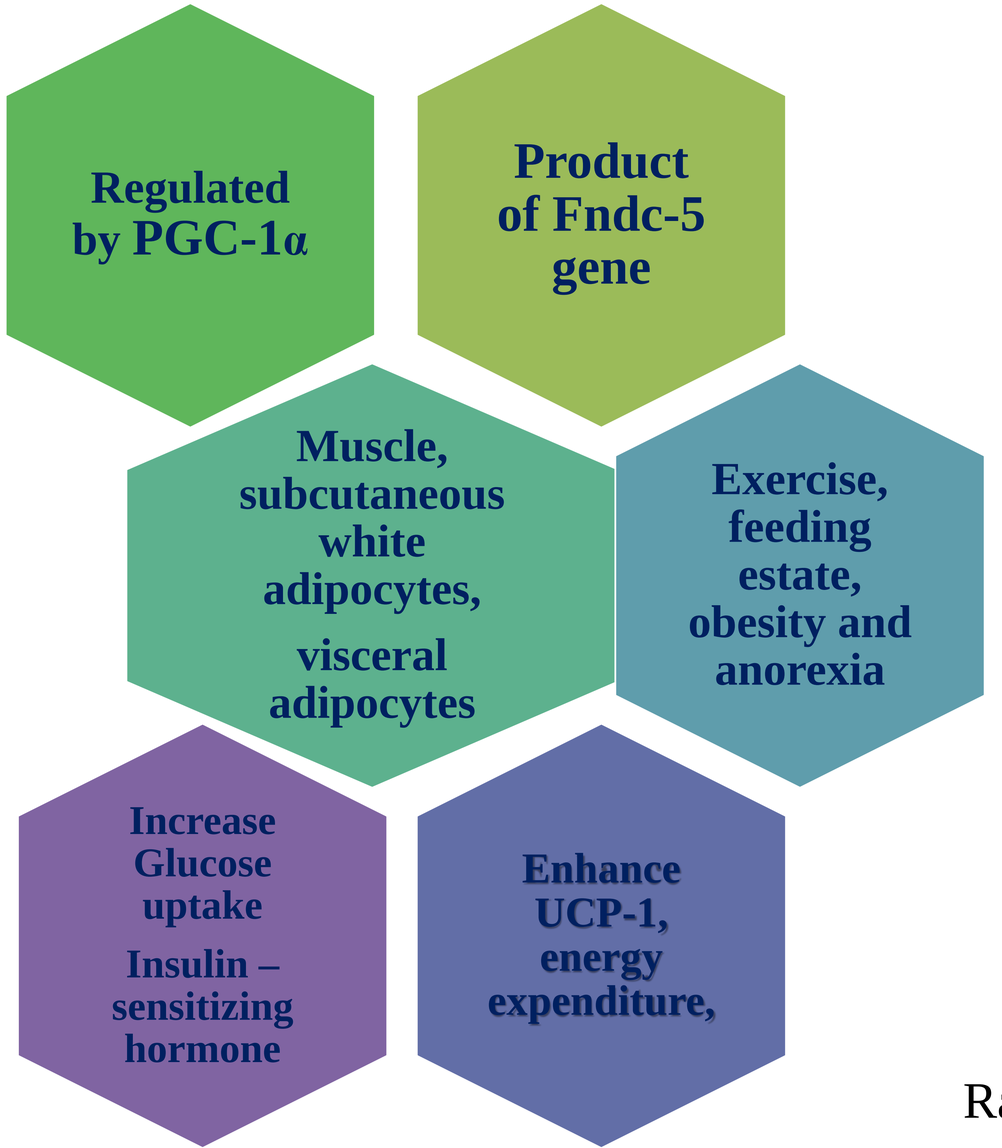


TRF (Tocotrienol Rich Fraction) γ-Tocotrienol

- The most **active isoform** of tocotrinols
- Cholesterol-lowering, decreasing the risk of cardiovascular disease, immunomodulatory effects, apoptotic effects in cancer cells.
- **Anti-obesity properties.**

Wong SK etal ,2018 ,Wong SK et al, 2017

Irisin



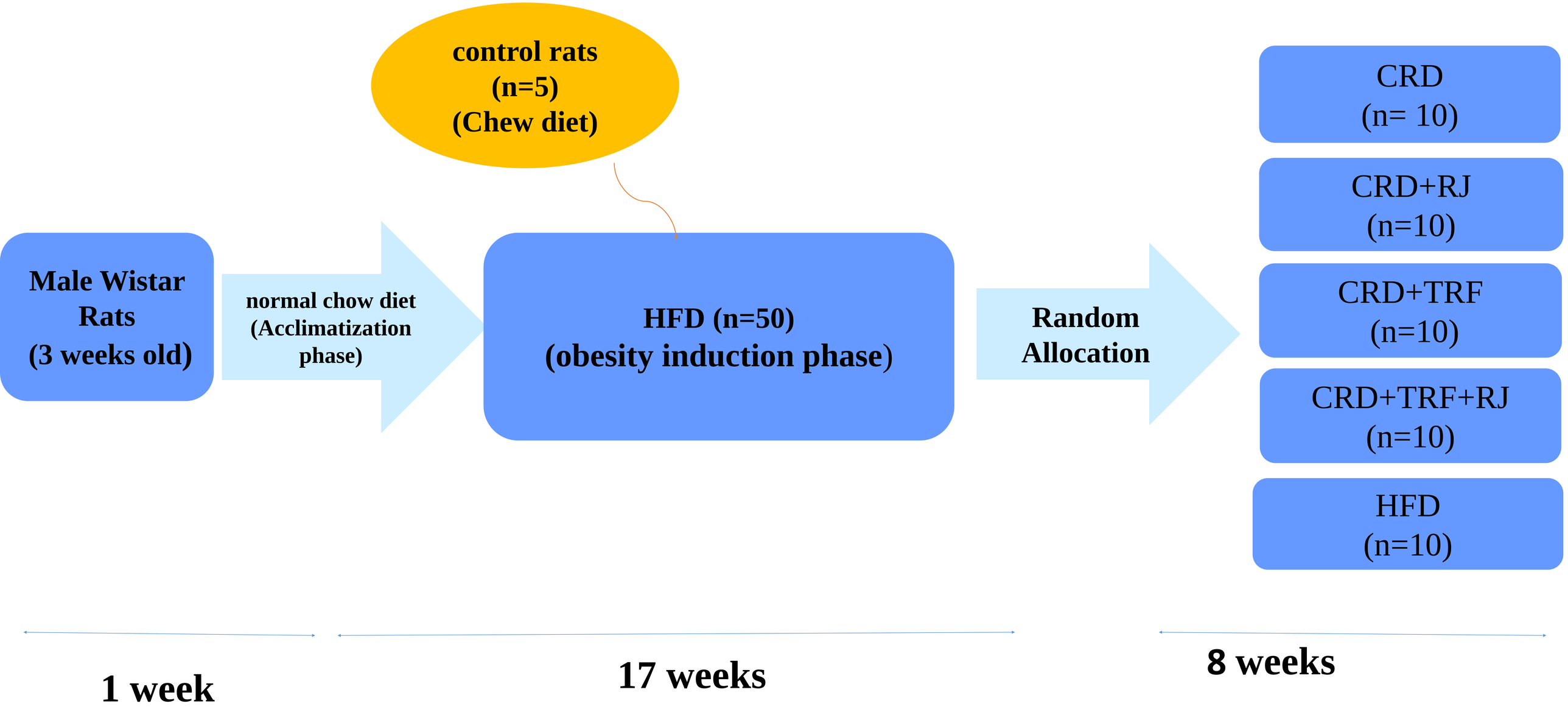
Raschke, Elsen et al. 2013

Main objective

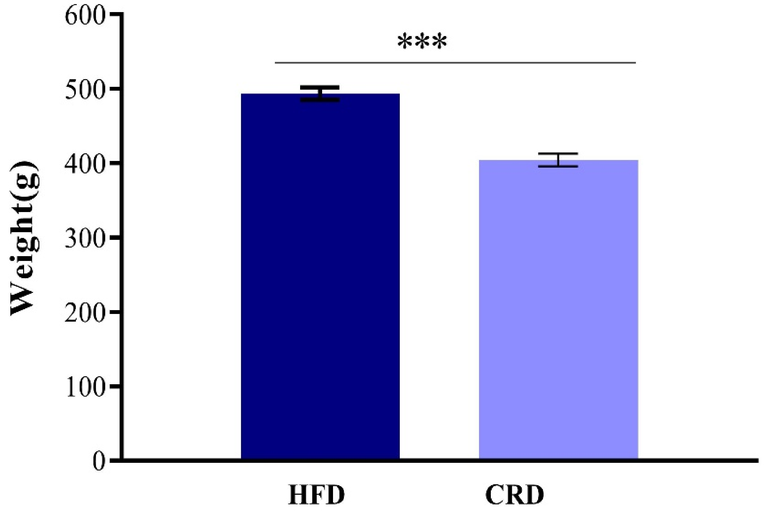
- Anti-obesity characteristics of RJ and TRF

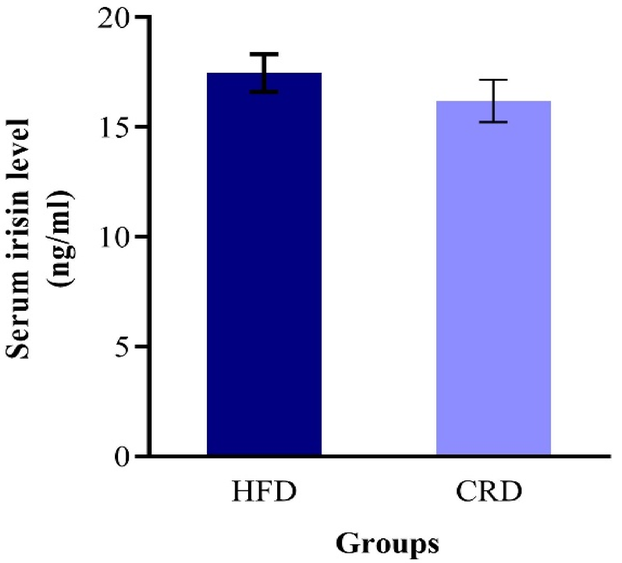
- Common regulatory metabolic pathways of RJ, TRF, and irisin

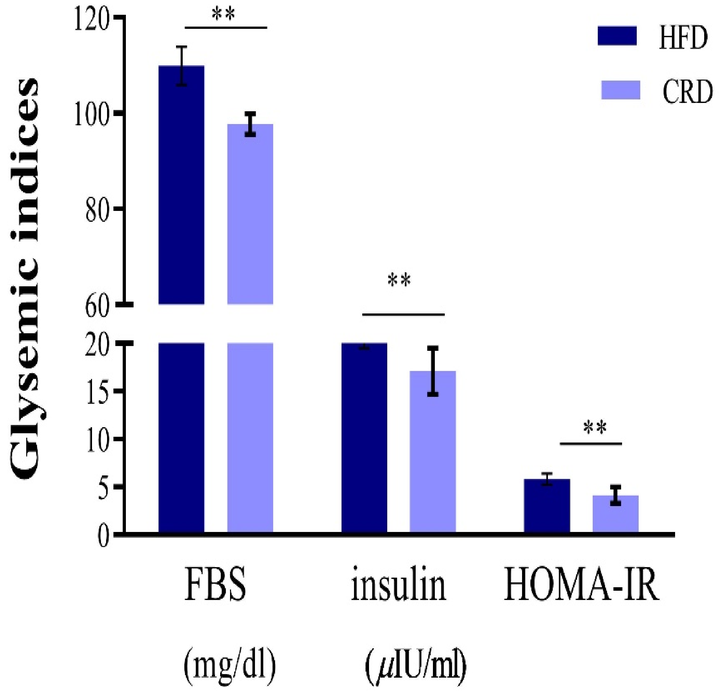
1)The effects of RJ, TRF, and their combination on glucose hemostasis and inflammatory indices.
2) The intermediary role of the irisin in the positive role of RJ and TRF as the functional food
in obese rats fed a calorie-restricted diet.


control rats
(n=5)
(Chew diet)
Male Wistar Rats
(3 weeks old)
normal chow diet
(Acclimatization phase)
HFD (n=50)
(obesity induction phase)
Random Allocation
CRD
(n= 10)
CRD+RJ
(n=10)
CRD+TRF
(n=10)
CRD+TRF+RJ
(n=10)
HFD
(n=10)
1 week
17 weeks
8 weeks

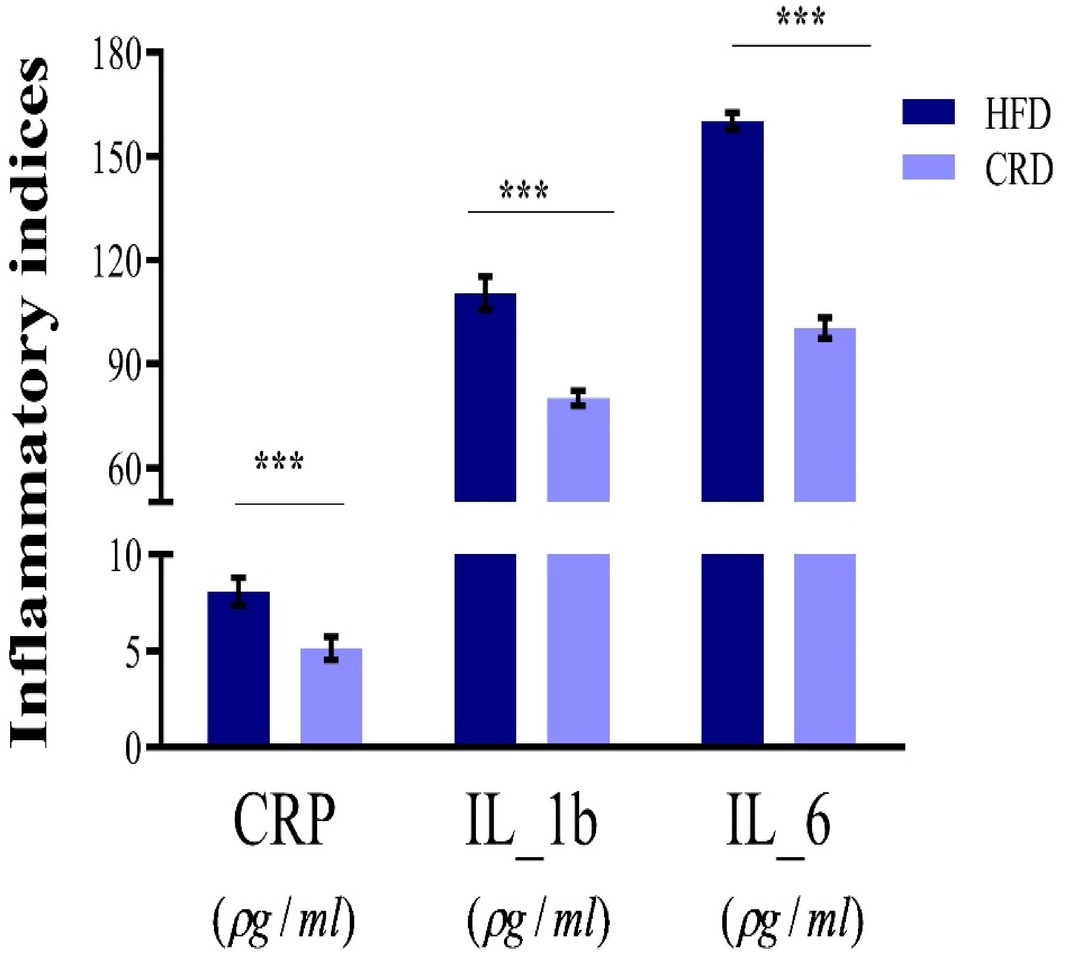
Results

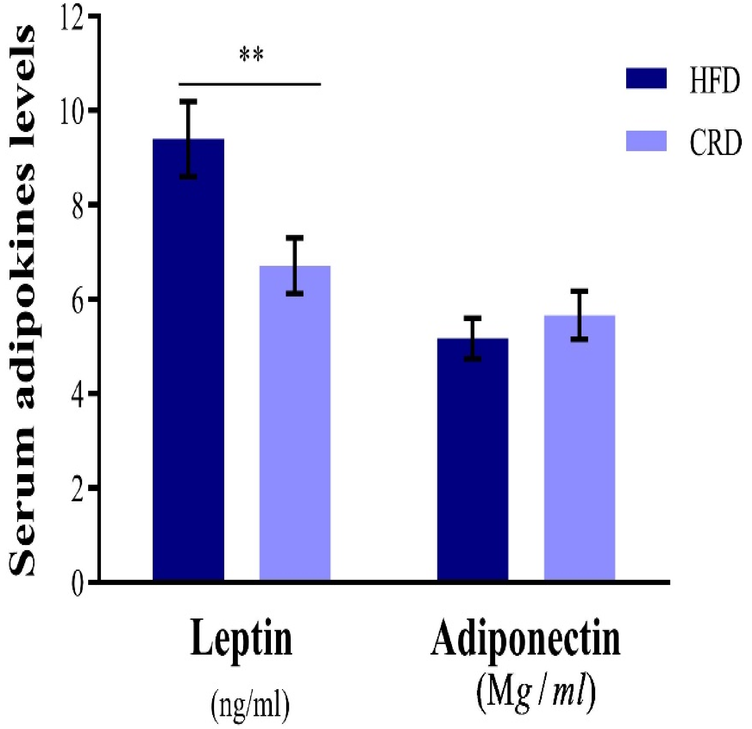

600
500
400
300
200
100
0
Weight(g)
***
HFD
CRD


20
15
10
5
0
Serum irisin level (ng/ml)
HFD
CRD
Groups

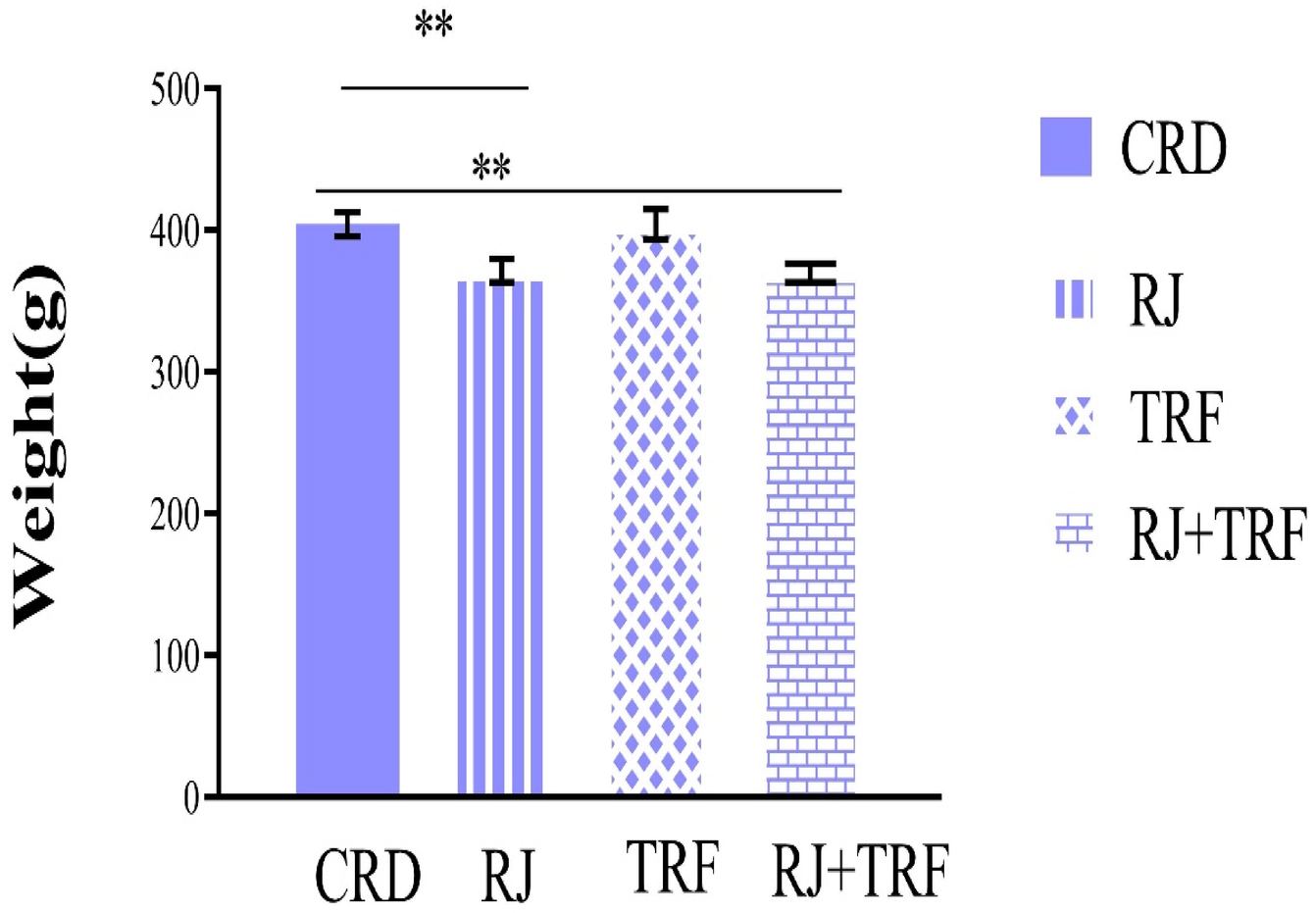

120
100
80
60
20
15
10
5
0
Glysemic indices
**
**
**
HFD
CRD
FBS
(mg/dl)
insulin
(μIU/ml)
HOMA-IR

Results(cont.)





Results(cont.)



Results(cont.)

Table2) comparison of biochemical parameters between studied groups after 8 weeks of intervention.

Variables	RJ	TRF	RJ+TRF	CRD	P-Value §
irisin (ng/ml)	19.53±0.84	17.87±0.68	19.78±0.75	16.19±0.97	
P-Value*	0.033	0.481	0.019		0.013
FBS (mg/dl)	88.91±1.94	82.44± 1.46	83.73± 1.74	97.79± 2.18	
P-Value*	0.009	<0.001	<0.001		<0.001
Insulin (µIU/ml)	12.32± 0.32	14.34± 0.52	12.15± 0.45	17.13± 0.41	
P-Value*	<0.001	<0.001	<0.001		<0.001
HOMA-IR	2.71± 0.11	2.92± 0.14	2.52± 0.13	4.15± 0.18	
P-Value*	<0.001	<0.001	<0.001		<0.001
Leptin (ng/ml)	4.87±0.41	6.57±0.22	4.71±0.39	6.71±0.59	
P-Value*	0.022	0.996	0.011		0.002
Adiponectin(pg/ml)	6.90 ± 0.60	6.03 ± 0.53	6.60 ± 0.50	5.66± 0.51	
P-Value*	0.384	0.963	0.617		0.381

Results(cont.)

Table2) comparison of biochemical parameters between studied groups after 8 weeks of intervention.

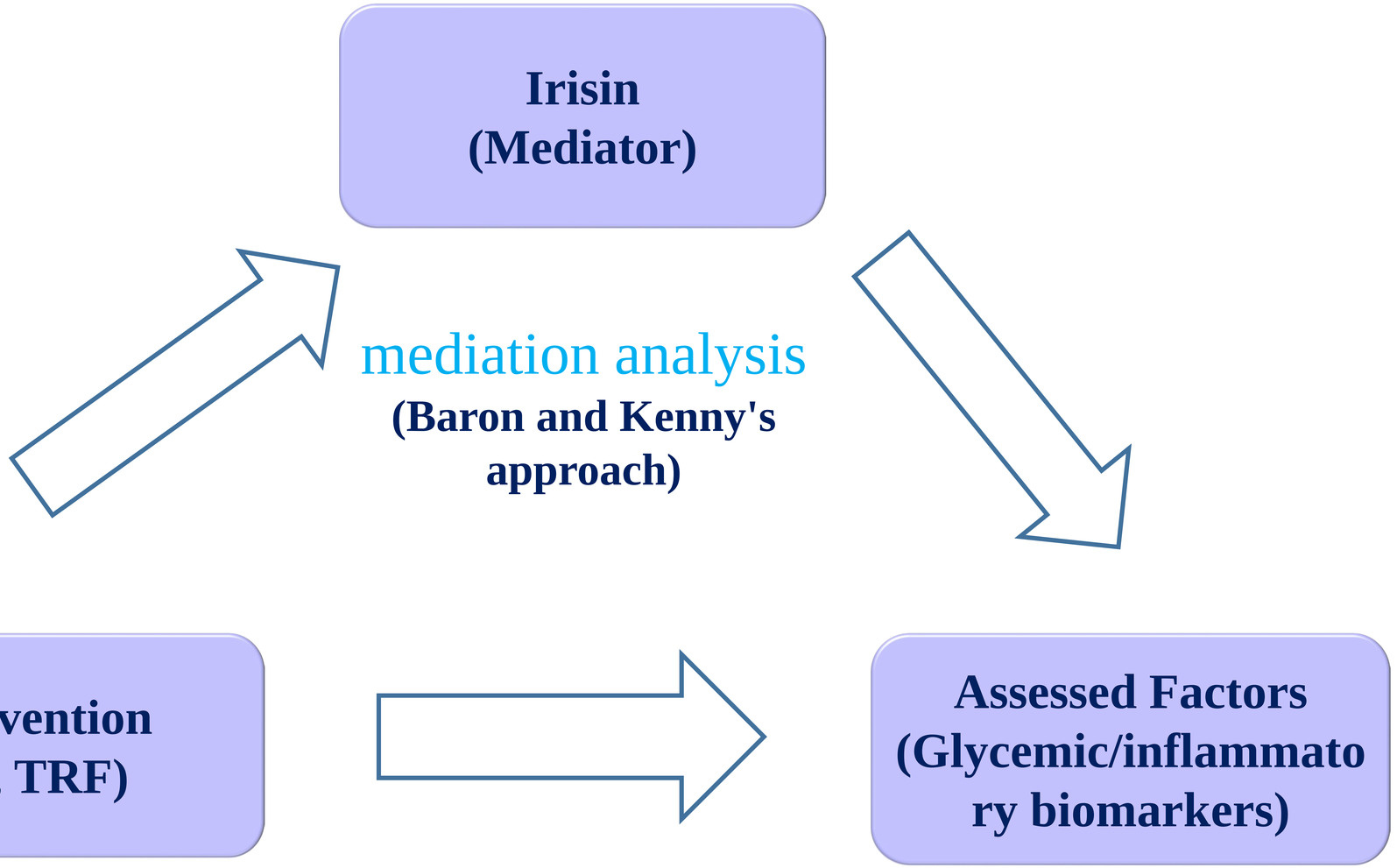
Variables	RJ	TRF	RJ+TRF	CRD	P-Value §
CRP (pg/ml)	3.42±0.36	3.06±0.42	3.16±0.25	5.14±0.60	
P-Value*	0.036	0.008	0.013		0.005
IL_1β (pg/ml)	75.52± 0.47	74.68±0.58	73.94±0.60	80.21±2.23	
P-Value*	0.047	0.014	0.005		0.004
IL-6 (pg/ml)	92.65±1.99	94.78±1.96	90.55 ± 2.85	100.43±3.01	
P-Value*	0.143	0.394	0.040		0.049

Results(cont.)

Table3) association of serum irisin values (ng/mL) with glycemic, inflammatory and adipokines levels.

	FBS	Insulin	HOMA-IR	CRP	IL-6	IL-1β	Leptin	Adiponectin
Irisin					n=40			
r	-0.630	-0.707	-0.739	-0.252	-0.326	-0.326	-0.572	0.453
P-Value	<0.001	<0.001	<0.001	0.117	0.597	0.050	<0.001	<0.001

Results(cont.)



Results(cont.)

According to Baron and Kenny's approach:

1. **RJ is associated with changes in glucose hemostasis markers, including FBS, insulin, HOMA_IR, and leptin levels.**
2. RJ is associated with changes in irisin levels as hypothesized mediators.
3. Changes in irisin concentrations are related to changes in FBS, insulin, HOMA_IR, and leptin levels.
4. A previously significant association between RJ and FBS, insulin, HOMA_IR, and leptin was attenuated or no longer significant when controlling for the effect of irisin on the abovementioned outcomes.

Conclusion

- RJ and TRF improve body weight and obesity-related comorbidities, including inflammation and hyperglycemia in obese rats, and amplify the beneficial impacts of a calorie-restricted diet.

- RJ remarkably elevates irisin concentrations in HFD-induced obese rats.

Conclusion(cont.)

- Hypoglycemic properties of RJ are related to irisin since it mediates the anti hyperglycemic effects of RJ.

- The effects of RJ and irisin on obesity-induced metabolic complications occur through common pathways, which include inducing thermogenesis through the browning of white adipose tissue, activation of brown adipose tissue, and increasing energy metabolism.


Thanks for attention