Effects of *Annona muricata* Biofunctionalized Gold Nanoparticles on Erythrocyte Osmotic Fragility and Hematological Profile in Rats Model

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Introduction

- Nanomedicine is making huge impact in the healthcare sector for the treatment of various chronic diseases.

- Hence, eco-friendly synthesis of nanoparticles especially from medicinal plants is considered as building blocks of the forthcoming generations to cure or manage various diseases (Mieszawska *et al*., 2013).

- Metallic nanoparticles can serve as vehicles for delivery of bioactive molecules from plants having distinct advantages over Crude extract, which includes enhance solubility, bioavailability and pharmacological activity (Patra *et al*., 2015).

Objectives

- The objectives of this study were

1. Synthesize gold nanoparticles using *Annona muricata* aqueous leaf extract (AMAE)

2. Characterize the biofunctionalized gold nanoparticles (A*AuNPs)

3. Evaluate the effects of the A*AuNPs on erythrocyte osmotic fragility and hematological profile in male Wister rats model.

Methodology

Annona muricata (Soursop)

Aqueous Extraction

Aurochlorohydric acid
($HAuCl_4.3H_2O$)

Annona muricata Aqueous Leaf Extract
(AMAE)

Patra *et al.*, 2015

Dispersed A*AuNPs

Characterization

UV-Vis spectroscopy | X-Ray Diffractometry | FT-IR spectroscopy

Minka and Ayo, 2013
Erythrocyte Osmotic Fragility

Kumar *et al.*, 2013
Hematological Analysis

Experimental Setting

- Male Wister rats were allowed to acclimatize for two week and then divided into five groups of eight (6) rats per group

- Group I was given normal feed and served as control
- Group II was administered 100mg AMAE/kg body weight
- Group III was administered 100mg standard gold nanoparticles (S*AuNPs)/kg body weight
- Group IV was administered 100mg A*AuNPs/kg body weight
- Group V was administered 200mg A*AuNPs/kg body weight

- All treatments were given orally, and lasted for 28 days

Results and Discussion

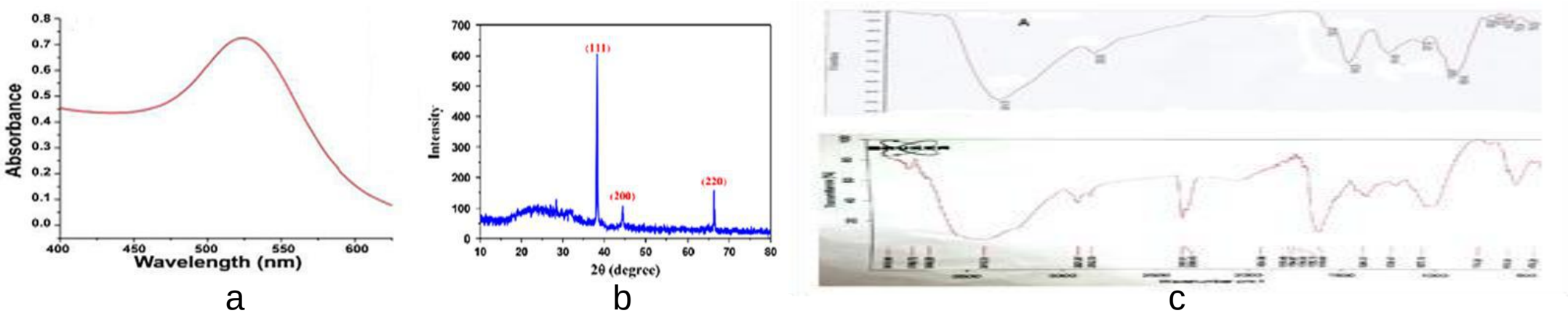

Figure 1. Characterization of annona muricate functionalized gold nanoparticles (A*AuNPs). (a) UV-visible spectra of A*AuNPs); (b) XRD pattern (c) FT-IR of, A*AuNPs (top) and AMAE (bottom)

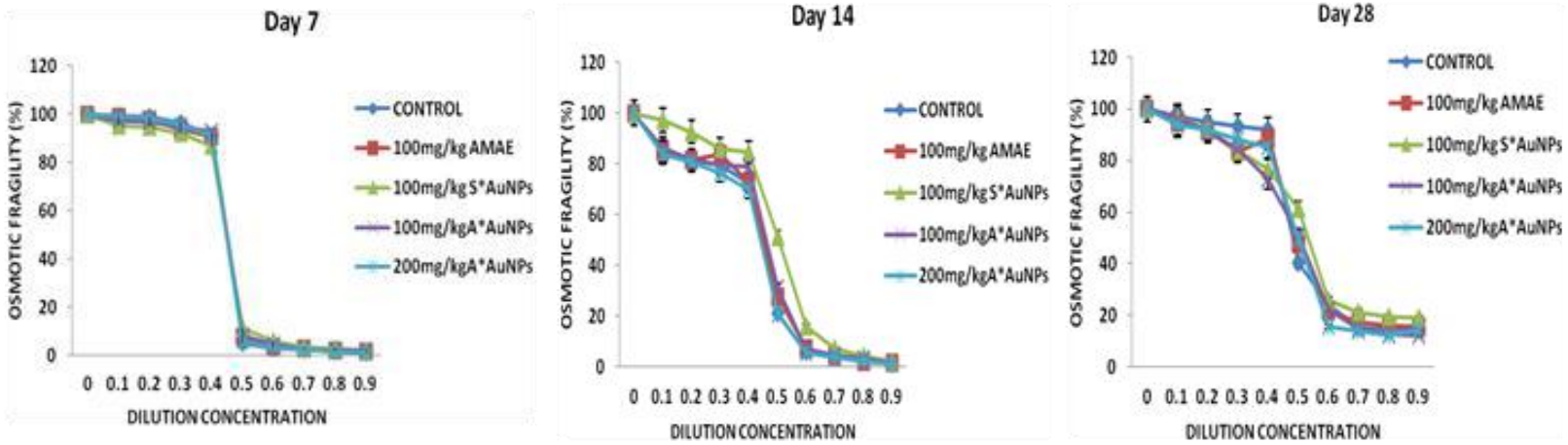

Figure 2. Effect of treatments on Erythrocyte Osmotic Fragiligram at day 7, 14 and 28 respectively. Values are means (n = 6) ± SD.

Results and Discussion

Table 1: Red Blood cell differentials of rats after 28 days of treatment

Group	Red Blood cell differentials					
	RBCs (x10³/µl)	***Hb (g/dl)***	***PCV (%)***	***MCHC (g/dl)***	***MCH (pg)***	***MCV (fl)***
I	3.61±0.30^{abcde}	11.20±0.20^{a}	40.16±0.20^{ab}	42.20±2.00^{abce}	23.97±2.00^{ace}	62.47±1.00^{ace}
II	3.47±0.40^{bacde}	11.57±0.10^{bc}	41.53±0.10^{be}	42.70±1.00^{ba}	24.77±1.00^{b}	63.17±1.00^{b}
III	3.75±0.10^{cabde}	11.31 ±0.30^{cb}	43.01±0.20^{c}	41.82±3.00^{cad}	23.89±1.00^{cae}	62.42±2.00^{ca}
IV	3.33±0.40^{db}	12.03 ±0.10^{d}	38.98±0.30^{da}	41.37±^{c}2.00^{d}	24.20±1.00^{d}	61.83±3.00^{de}
V	3.64±0.20^{eabc}	11.22 ±0.10^{ae}	41.57±0.10^{eba}	42.10±1.00^{ae}	23.83±2.00^{eca}	62.00±2.00^{eac}

Data are presented as mean (n = 6) ± SEM. Values in the same column and category not sharing a common letter (a–e) differs significantly at $p < 0.05$. Hb, hemoglobin; cells; RBC, red blood cells; MCV, mean corpuscular volume; MCH, mean corpuscular hemoglobin; PCV, pack cell volume; MCHC, mean corpuscular hemoglobin content

Table 2: Platelets, white blood cells and differentials of rats after 28days of treatment

Group	White Blood cell differentials				
	Platelet (µl)	***WBC (x10³/µl)***	***Lymphocytes (%)***	***Monocytes (%)***	***Neutrophils (%)***
I	302.67±2.08^{ac}	3.32 ±0.08^{a}	64.53±0.30^{ade}	13.63±0.40^{ab}	28.89±0.60^{ae}
II	306.17±0.08^{bde}	3.87 ±0.10^{b}	72.16±0.20^{b}	13.51±0.50^{ba}	33.15±0.30^{bc}
III	302.35±3.01^{ca}	4.12 ±0.20^{ce}	79.01±0.50^{c}	13.97±0.10cab	33.83±0.50^{cb}
IV	305.33±4.73^{dea}	3.53 ±0.10^{d}	67.88±0.30^{dae}	13.51±0.50^{dba}	31.76±0.30^{d}
V	305.00±3.46^{ed}	4.15 ±1.00^{ec}	65.47±0.60^{ea}	14.01±0.20^{ecab}	28.93±0.40^{ea}

Data are presented as mean (n = 6) ± SEM. Values in the same column and category not sharing a common letter (a–d) differs significantly at $p < 0.05$. WBC, white blood count

Conclusions & Recommendations

In this study, the aqueous leaf extract of *Annona muricata* initiated nucleation and growth of the gold nanoparticles from aurochlorohydric acid.

Alkaloids, flavonoids and tannins present in the plant extracts have been considered to be responsible for the bioreduction process.

The result obtained clearly revealed the role of A*AuNPs in maintaining erythrocyte membrane integrity and their biocompatibility in living systems.

They are therefore considered safe for biotechnological applications

References

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