

An original Asteraceae-infusion able to prevent a syndrome metabolic induced in fructose rat model: Beneficial effect of a mixture of chicoric and chlorogenic acids.

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Introduction

Metabolic syndrome (MetS) is a cluster of metabolic abnormalities characterized by a complex pathophysiology including oxidative stress, chronic low-grade inflammation and insulin resistance. The main management strategy for MetS is lifestyle management, pharmacological treatment may also be prescribed. Plants with their pleiotropic active substance content can be an interesting complementary approach through phytotherapy or health food [1].

Our previous study showed an antidiabetic effect of an chicory root extract (NCRAE) rich in chlorogenic (CGA) and Chicoric (CRA) acid at a ratio of 30/70 on streptozotocin rats. Intraperitoneal administration of NCRAE for 7 days had major insulin sensitizing effects without any impact on insulin secretion. Implication of CRA and CGA in extract has been demonstrated in the experiment by using a mixture in the equivalent ratio[2]. Moreover, *in vitro* study have shown that NCRAE didn't have effect on hepatic glycogenolysis activity in contrast to CGA [3].

Aims of study: Investigate the possibility to prevent MetS by an Asteraceae infused drink from dried burdock (*Arctium lappa* L.) roots and dandelion (*Taraxacum officinale*) leaves, containing an NCRAE like ratio in CRA and CGA.

Materials and methods

1-Infused drink preparation

Burdock root (*Arctium lappa*)
Dandelion leaf (*Taraxacum officinale*)
From certified company Nature valley (Maine-et-Loire; France).

Immersion in equal parts (w/w) in boiling water for 3 min.

-Rest of 30 min and filtration
-Check of the CGA/CRA ratio by LC-MS

2-In vivo experiment

Wistar rat
180-200g
N =26

Acclimatization week

Week -1

Induction MetS
+ 10% fructose
in water

Experimentation weeks

Week 0

Control (normal diet)

Fructose

Fructose No treated (N=6)

Fructose treated Asteracea (N=8)
(500 mg/Kg/J)

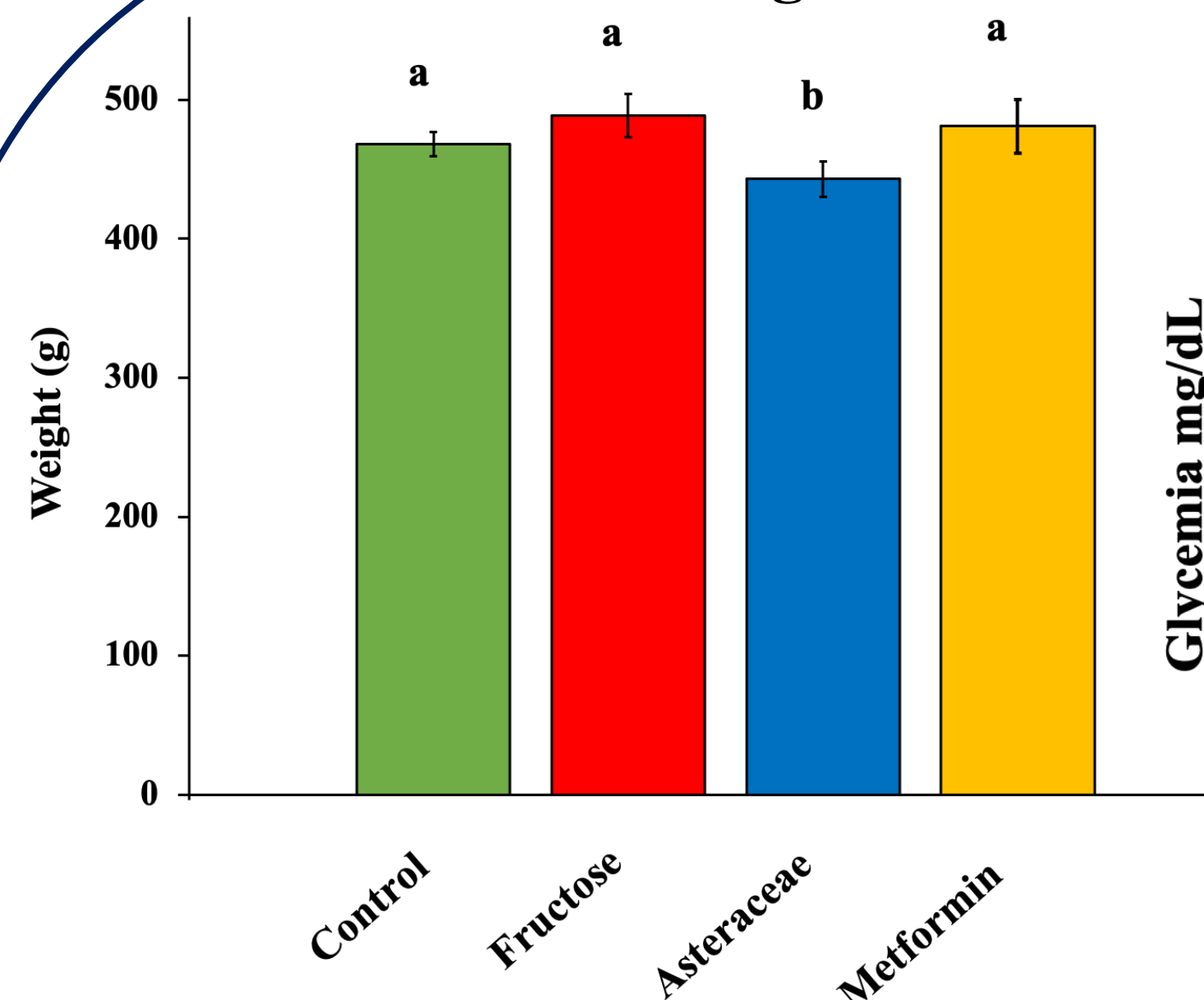
Fructose treated metformin (N=6)
(100 mg/kg/J)

Parameter evaluated

-Animal weight
-OGTT : (Oral glucose tolerance test)
-IPTT : (Intraperitoneal insulin tolerance test)
Glycemia, Insulinemia, Triglyceridemia

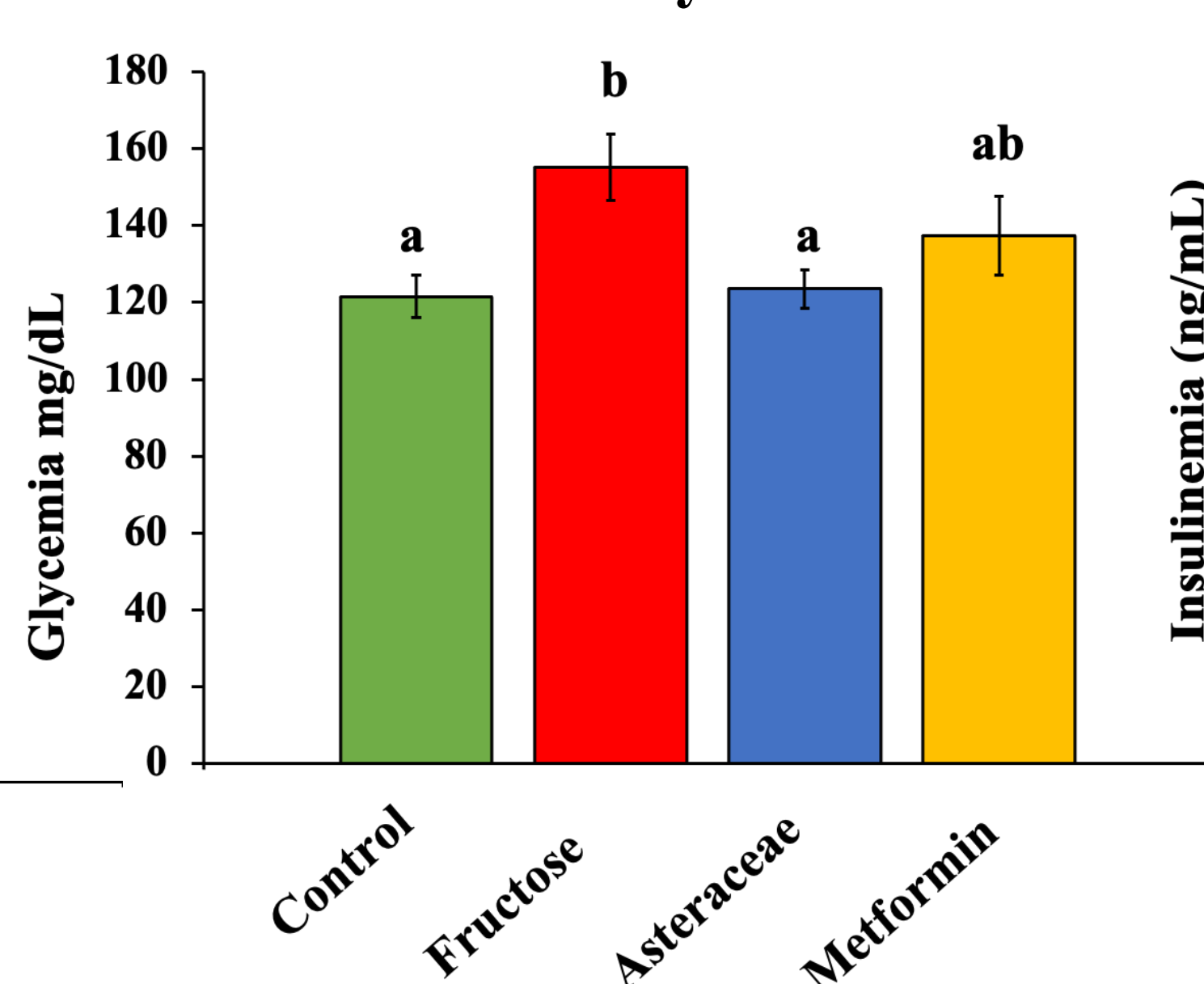
Results

1-Weight



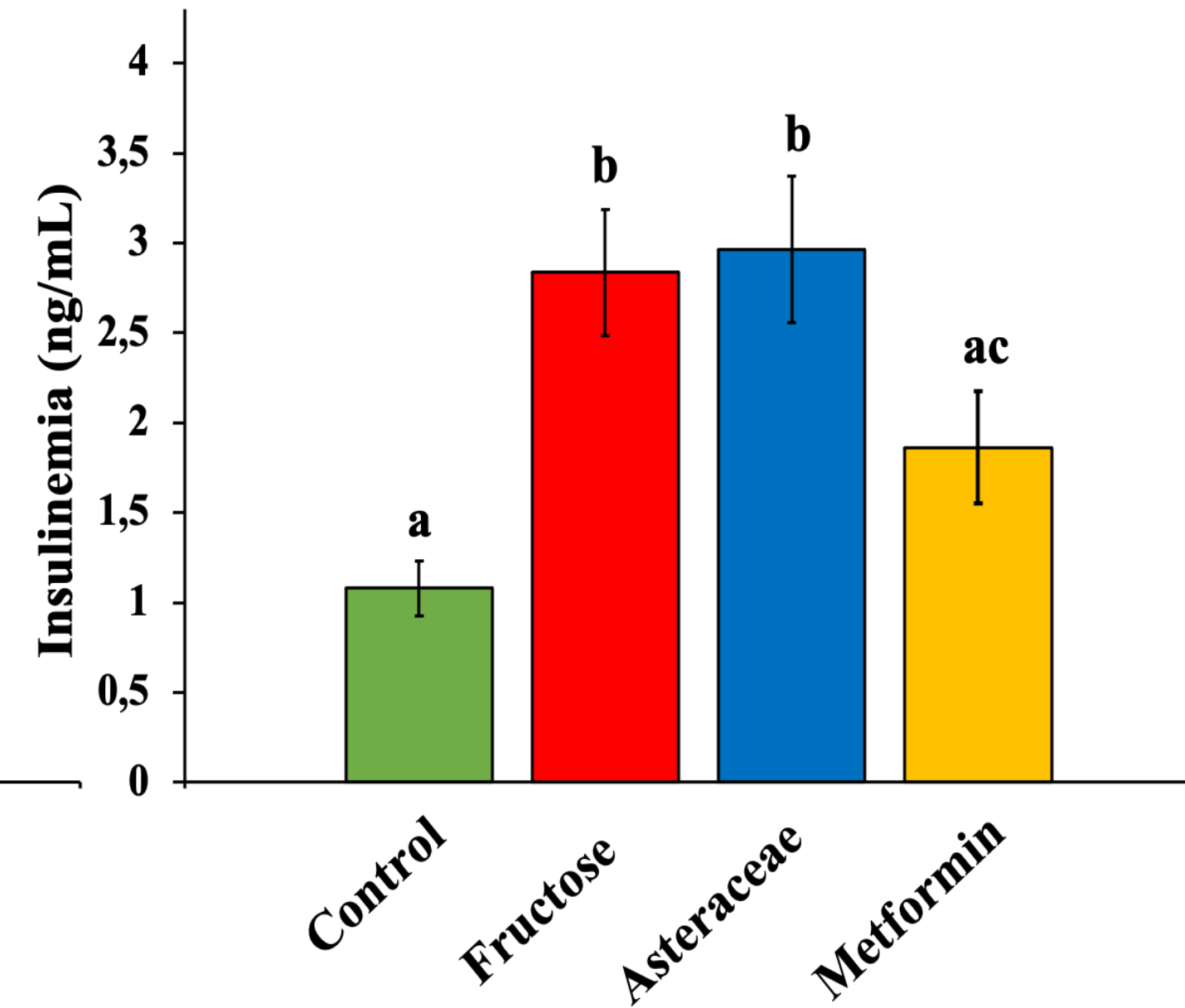
❖ After 8 weeks, only treatment of Asteraceae infusion shows a significant decrease in weights of animals.

2-Glycemia



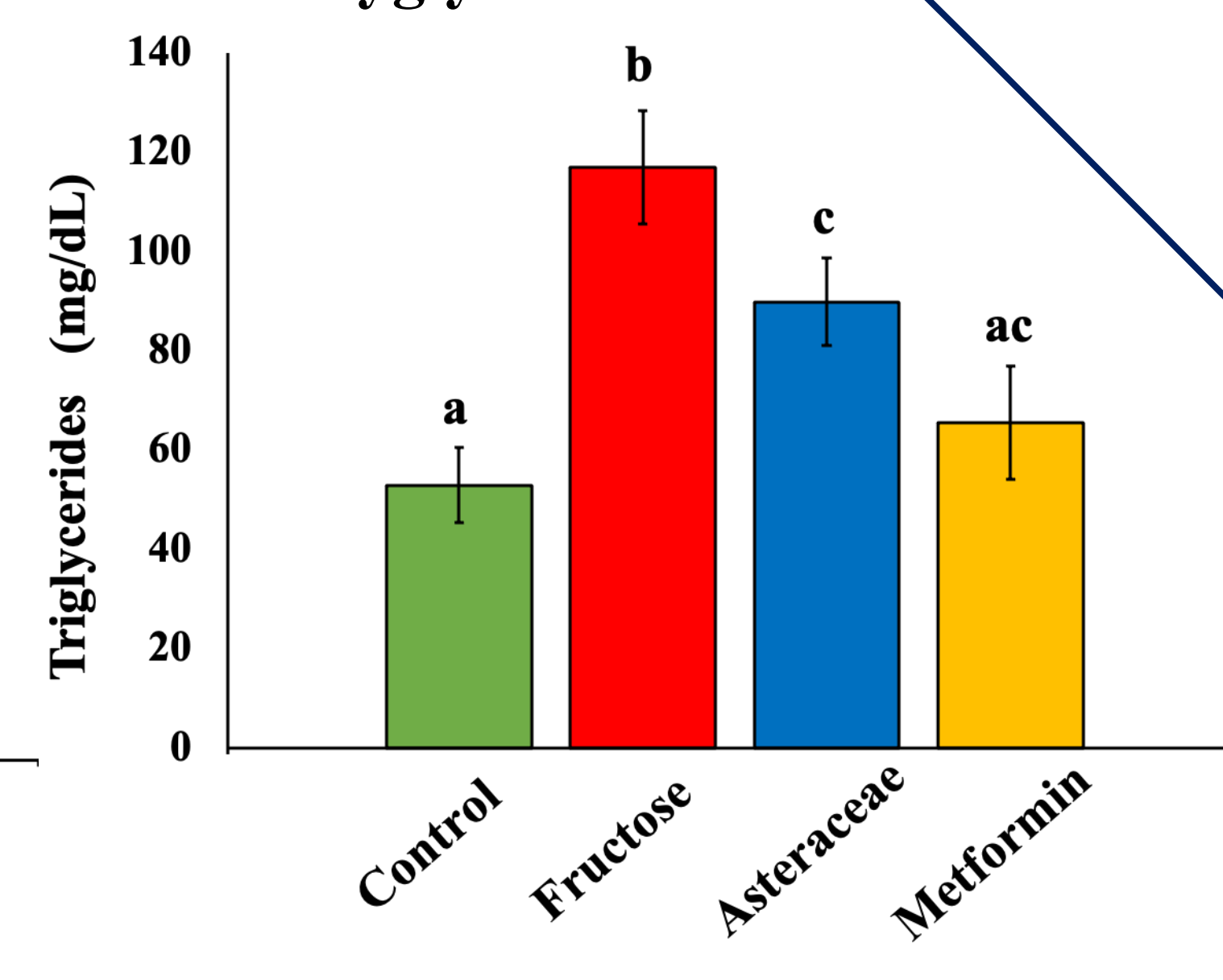
❖ Fructose supplementation induced a clear hyperglycaemia compared to control rat. Asteraceae infusion and metformin allow to regulate basal glycemia.

3-Insulinemia



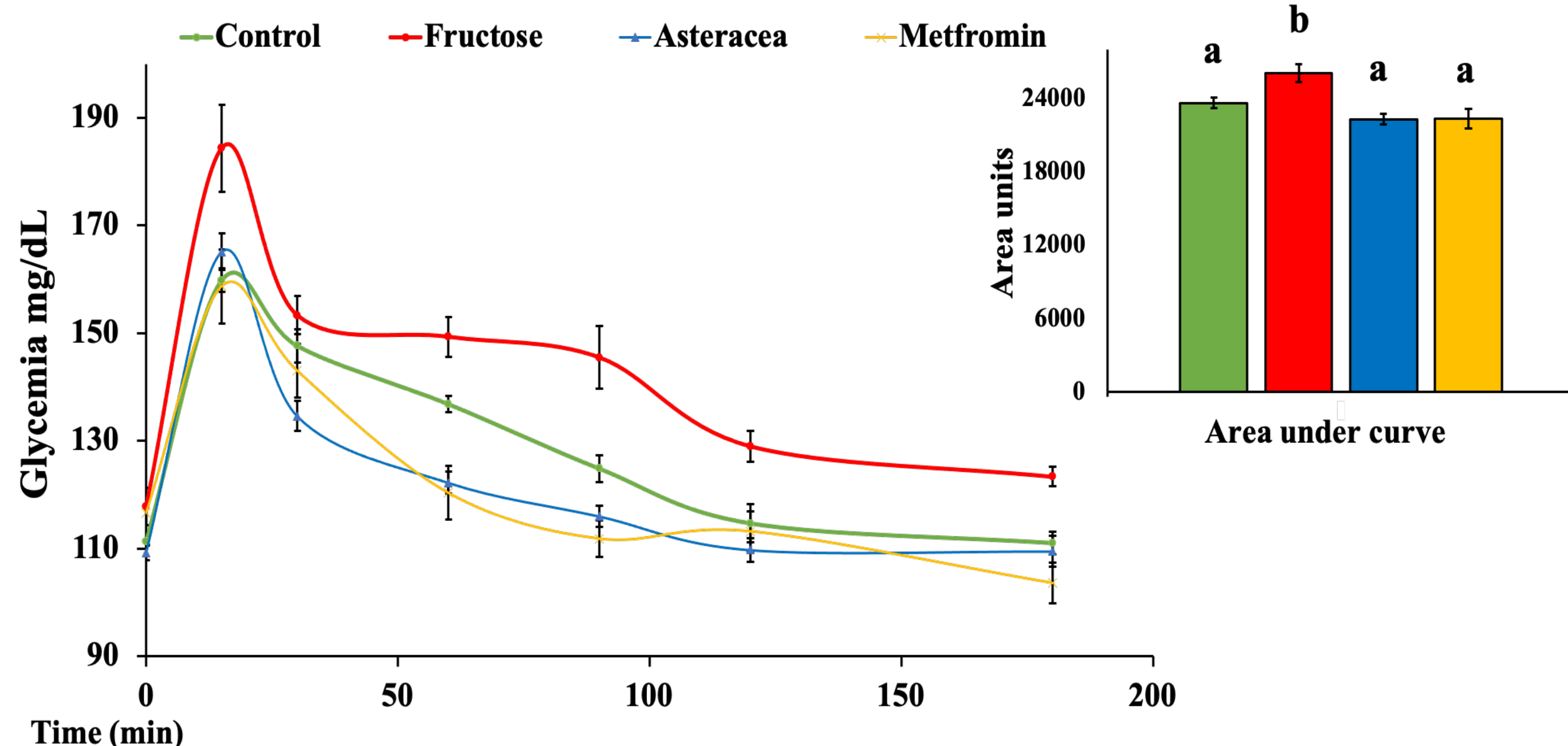
❖ Fructose supplementation induced a clear hyperinsulinemia compared to control rat. Metformin allow to regulate basal insulinemia unlike Asteraceae infusion.

4-Triglyceridemia



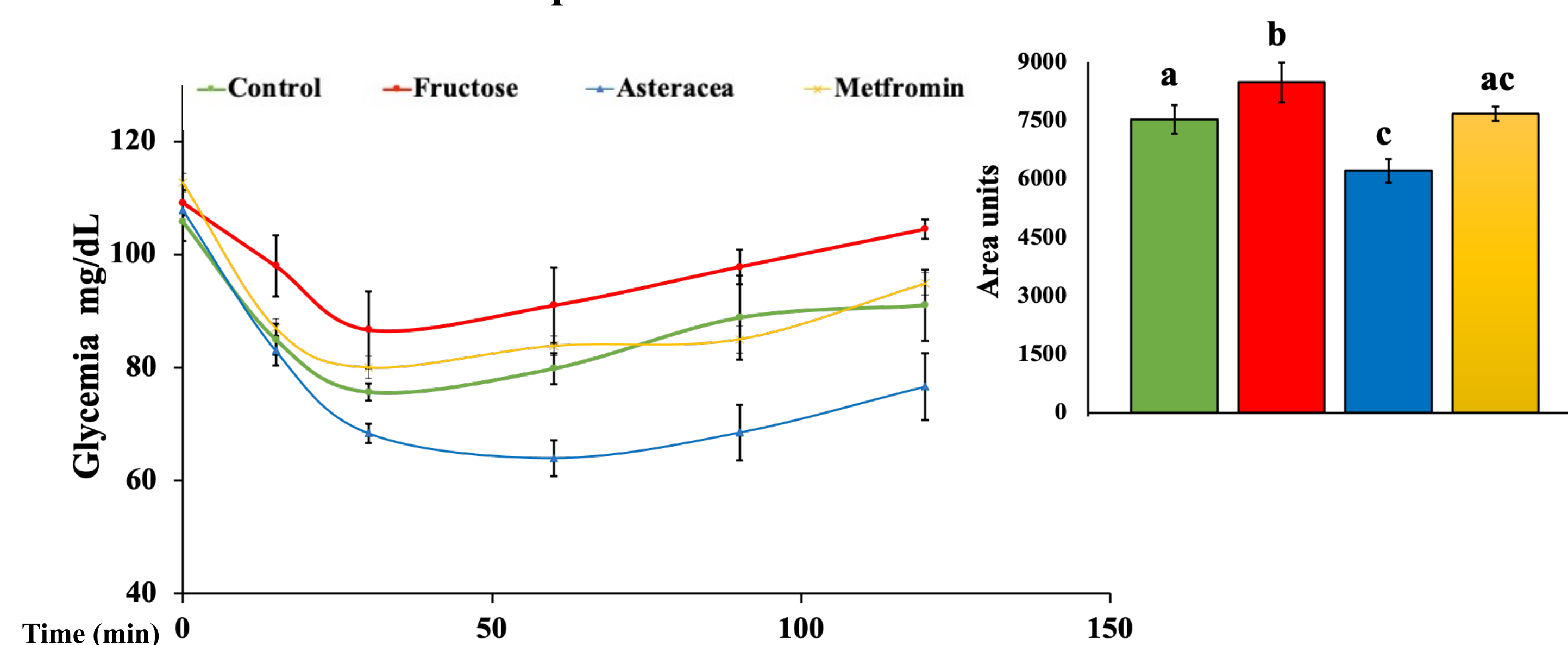
❖ Fructose supplementation induced a clear hypertriglyceridemia compared to control rat. Asteraceae infusion and metformin allow to significantly regulate basal triglyceridemia.

5-Oral glucose tolerance test



❖ Oral glucose intake provoked an hyperglycaemia peak after 15 min and return to normal glycemia for all groups. This peak is significantly higher in fructose rats compared to control group. Daily treatment with Asteraceae and metformin reduced the hyperglycaemic peak to normal value. The return to basal glycaemic values was slow for fructose rats compared to all others groups.

6-Intraperitoneal Insulin tolerance test



❖ In control rats, intraperitoneal injection of insulin induces a hypoglycaemic peak after 30 min and then glycemia progressively rise to basal value. Supplementation with fructose show both: smaller reduction and rapid return in blood glucose. Treatments with metformin show a similar trend as the control rats. Treatments with Asteraceae shows a drastic fall in glycemia which continued more than 120 min probably indicate **inhibition of neoglucogenesis**.

Conclusion

1- Supplementation with Asteracea infusion :

-Had major effect on the animals weight and in insulin sensitivity.

-Allowed a return to basal blood levels of glycemia and triglycerides but didn't regulate **insulin levels** which indicates a stimulation of **insulin secretion**.

2- Previous effects of NCRAE have not been observed in fact, **insulin stimulating** and **neoglucogenic** effect indicates a CGA like effect.

References

- [1] Awwad, A., Pouchet, P., Idres, A.Y., Bidel, L., Tusch, D., 2020. The bitter Asteraceae: An interesting approach to delay the metabolic syndrome progression.
- [2] Ferrare, K., Bidel, L.P.R., Awwad, A., Pouchet, P., Cazals, G., Lazennec, F., Azay-Milhau, J., Tournier, M., Lajoix, A.-D., Tusch, D., 2018. Increase in insulin sensitivity by the association of chicoric acid and chlorogenic acid contained in a natural chicoric acid extract (NCRAE) of chicory (*Cichorium intybus* L.) for an antidiabetic effect.
- [3] Jacqueline Azay-Milhau, Karine Ferrare, Jeremy Leroy, Jordan Aubarterre, Michel Tournier, Anne-Dominique Lajoix, Didier Tusch. Antihyperglycemic effect of a natural chicoric acid extract of chicory (*Cichorium intybus* L.): A comparative in vitro study with the effects of caffeic and ferulic acids.