Reproductive Safety Study with *Mangifera indica* in Mice

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**Abstract:** Mango fruit (*Mangifera indica*) is rich of phytoestrogens, polyphenols, calcium, iron and potassium which play an important role in bone and dental growth and development. The aim of this study was to determine the effect of *M. indica* on embryos in pregnant mice. Twenty four pregnant mice were equally divided into 3 groups of those receiving aqueous extract of the mango fruit, its alcoholic extract and the control group receiving just distilled water. Animals were sacrificed at 19th day of pregnancy and embryos were removed and fixed in 10% formalin for histological studies. No abnormality and teratogenic effects were noticed in bone, cartilage, liver, spleen, kidney, digestive tract and spinal cord tissues. *M. indica* can be administered safely during pregnancy while improves bone and dental tissues growth and development.

**Key words:** *Mangifera indica* • Teratogenic Effect • Mouse • Embryo

**INTRODUCTION**

*Mangifera indica* (Mango fruit) from the family of Anacardiaceae is a domestic fruit in India and Himalyia regions. It is rich in B-carotene and vitamin C which are antioxidant compounds preventing release of free radicals and risk of cancer. The fruit is consisted of many ingredients including phytoestrogens, polyphenols (gallic acid, mangiferrin, ellagic acid), isoflavons (genistein, daidazin), benzoic acid, citric acid, pigments and tannin [1]. Worldwide mango production has increased about 9% from 35.5 million metric tons in 2008 to 38.7 million metric tons in 2010, highlighting the economic importance of mango in the international commodity market [2].

Isoflavons can prevent osteoclast activity [3] and were shown to activate bone mineralization [4, 5]. Lapoel as one of the ingredients of mango was demonstrated to be responsible for its antioxidant, antimutagenic and anti-inflammatory properties [6-10]. Mango is also rich in B-cryptoxanthine with antioxidant property and can prevent the probable damages produced by free radicals in cases of osteoarthritis. It is responsible for an increase in the glutathione level and the decrease in the level of nitric oxide, cox2, TNF-alpha and IL-6 [11]. The aqueous stem bark extract of Mangifera indica L. was shown to possess anti-inflammatory, antioxidant and analgesic properties [12]. This study was performed to evaluate the effect of mango on embryonic tissues in pregnant mice.

**MATERIALS AND METHODS**

To produce the mango extract, its powder form (150 g) was provided and mixed in 1000 ml of 50% ethanol alcohol and transferred into a perculator device for 3 days. It was filtered and then, in order to separate the solvent and concentrate the solution, a rotary instrument was used. A dessicator was applied for 24 hours to dry it and prevents its oxidation.

Twenty four 3 months old female mice with the mean weight of 25-30 g were provided from Shiraz University of Medical Sciences Laboratory Animal Center and were equally divided into 3 groups. The control group received just daily 200 mg distilled water, the second group...
received 300 mg/kg of aqueous extract of mango and the
third group received 300 mg/kg of hydroalcoholic extract
of the fruit. The duration of administration was 19 days
starting from the first day of pregnancy. The mango
extract was administered by a gavage.

At 19th day of pregnancy, under general anesthesia,
the abdomen was opened and by incision into uterus, all
embryos were checked for viability and then all were
transferred into a petri dish containing PBS to wash the
embryos and remove the presence of any blood. The
fetuses were evaluated for any macroscopic abnormalities.
The skeletons were also examined individually. One half
of the fetuses from each animal were fixed in 10% neutral
phosphate buffered formalin and serial sections were
provided from the head, thorax and abdomen. All tissue
samples were histologically evaluated and stained with
hematoxylin and eosin dyes (H&E).

RESULTS

No teratogenic effect was noticed histologically in all
tissues of the embryos isolated from pregnant mice at
19th day of pregnancy. Figure 1 denotes to a normal tissue
developing in gastrointestinal tract, liver and pancreatic
tissues and Figure 2 demonstrates a normal development
in spinal cord and bony tissues. A normal ossification
was noticed in cartilaginous tissues (Figure 3) and in
kidneys, the development was also normal (Figure 4), after
consumption of aqueous and hydro alcoholic extracts of
the mango fruit during pregnancy. No mortality or
mummified fetus was observed. The number of embryos
in each pregnant mouse varied from 8 to 10 with no
abnormal macroscopic changes in all organs too.

Fig. 1: A normal tissue developing in gastrointestinal
tract, liver and pancreatic embryonic tissues after
consumption of mango extract during pregnancy
(H&E, x100).

Fig. 2: A normal development in spinal cord and bone
embryonic tissues after consumption of mango
extract during pregnancy (H&E, x100).

Fig. 3: A normal ossification in cartilaginous tissues of
embryos after consumption of mango extract
during pregnancy (H&E, x100).

Fig. 4: A normal development in embryonic kidneys after
consumption of mango extract during pregnancy
(H&E, x400).
DISCUSSION

Our findings indicated to no abnormality in organs of embryos macroscopically and when studied histologically by H&E staining, no abnormality or teratogenic effect was visible. The growth and development of fetuses were normal denoting to the safe consumption of mango during pregnancy when a dose of 300 mg/kg of the fruit was used.

Similar findings were reported by Rodeiro et al. showing no teratogenic effect when mango was administered during pregnancy that may be due to presence of genistein in the fruit [12]. Genistein was shown to have positive effect on bone mineralization confirming the normal growth and development of the embryonic tissues [3]. Genistein was also demonstrated to play a stimulatory effect on protein synthesis and release of alkaline phosphatase by osteoclasts [4]. Tousen et al. also noticed that from 5th day of pregnancy to 13th day of birth, genistein administration had no negative effect on embryonic tissues and newborns when were administered during pregnancy [13].

In an experiment, the effect of replacing maize with raw or cooked mango kernel meal on the growth and blood parameters of broiler chickens was investigated and was shown that 20% of the maize can be replaced with boiled mango kernel meal in the diet of broilers without adverse effects on growth and blood parameters [14]. Therefore, we can conclude that as mango fruit had no teratogenic effects on embryonic tissues with no gross abnormality can be safely administered during pregnancy while its positive effects on growth and development increases its use too.

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REFERENCES


