Effects of ripe papaya (*Carica papaya*) seed powder on the seminiferous epithelium of the boar testis

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ABSTRACT

Carica papaya (pawpaw) is an economically important fruit of the tropics and subtropics. The fruit and leaves of pawpaw contain proteins and alkaloids of potential important medicinal, industrial and pharmaceutical applications; these include antimicrobial, anthelmintic and antifertility effects. These effects are attributed to many biologically active compounds of *C papaya*; Benzyl isothiocyanate and Papain are responsible for the anthelmintic activity and Oleanolic glycoside have the antifertility activity. Anthelmintic results of papaya indicate high efficacy against *Ascaris suum* while antifertility effects have been demonstrated in various species, including the primates.

In the tropics *Carica papaya* fruits are available all year round and are a significant dietary component of humans as fresh fruits and/or, vegetable or processed products. The remains in hotels and surplus in homes containing the papaya seeds are usually fed to livestock because of the perceived nutritional and medicinal values with no regard to the possible negative effects on reproduction of these animals. Since the pig is usually fed on swirl, most of which contains the

seeds of papaya and the fact that the extract of these seeds have already been shown to have negative effects on male fertility, the current study sought to establish the effects of papaya seed powder on boar fertility.

This study was designed to investigate the effects of papaya seed powder on testicular germinal epithelium and to evaluate if such effects were reversible after withdrawal of the consumption. To assess these objectives, pubertal boars were randomly selected and fed with dried papaya seed powder. Fifteen large white boars were randomly divided into two groups; 10 boars for the experimental group and 5 boars for the control group. Each of the boars in the experimental group received a daily dose of 300mg papaya seed powder mixed with 0.5 kg of Growers mash (Unga Ltd) while the control group received a similar daily dose of maize germ mixed with Growers mash (Unga Ltd). The experiment was carried out for 56 days to trace gradual changes in the germinal epithelium through one-and-half cycles of the spermatogenesis in the boar (one cycle is 39 days). After every two weeks, one boar from the control group and two from the experimental group were castrated. During the castrations, blood was also collected to assess hematological changes while testicular tissue samples were processed for histopathology. At the end of 56 days the remaining entire boars were maintained for 14 days and 60 days respectively without the papaya powder to assess the reversibility of the testicular effects of the powder.

The results of this study has shown that papaya powder had no effect on hematological parameters (red blood cell corpuscles, white blood cell corpuscles, hemoglobin, packed cell volume) and standard haematological indices (mean corpuscular volume, mean corpuscular hemoglobin and mean corpuscular hemoglobin concentration). However, clear histopathological changes were noticed on the seminiferous epithelium of the experimental group of boars and the changes were shown to be reversible and dependent upon duration of papaya seed extract

consumption. Initially, after 2 weeks of consumption there was mild disruption of germ cells. At 4 weeks the germ cells were desquamated and displaced to the seminiferous tubule lumen and the primary spermatocyte numbers in the experimental group were reduced (18.1 ±5.4) compared to the control (23.2±3.5). At 6 weeks the seminiferous epithelium was disorganized and the seminiferous lumen was empty. Again the primary spermatocyte count was 23.5±14 and round spermatid count was 27. 6±13.2 in the experimental group compared to the control group at (33.2±5.4 and 66.2±10.9) respectively. At 8 weeks there was severe degeneration of the seminiferous epithelium with detachment and displacement of germ cells. There was also a significant reduction in the round spermatids numbers in the treated group (19.5±8) compared to the control (75.2±10.8) and all was left in the tubules were mainly Sertoli cells and spermatogonia. It was observed that these changes were reversible 2 weeks after withdrawal of papaya powder consumption.

Although the exact mechanism for the effect of papaya seed extract cannot be explained by this study, it is concluded that papaya seed powder has a cumulative deleterious effect on the spermatocytes and spermatids by causing their disorganization, exfoliation and loss. However the spermatogonia, Sertoli and Leydig cells were not affected. From this study it is suggested that further investigation are required to establish exactly how the papaya seeds cause germinal epithelial pathology in this species. Probably these effects could be at testicular regulation of protein mRNA or other local paracrine factors because the blood parameters were not affected.