ANTI-FERTILITY EFFICACY OF THE PLANT POLYGALA JAVANA DC ON
MALE ALBINO RATS

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ABSTRACT  
Anti-fertility effect of ethanol extract of whole plant extract of Polygala javana was observed in male albino rats. The relative weight of the testes and epididymis were decreased. The epididymal sperm count, motility and sperm abnormality were reduced significantly in treated rats. There was an increase in serum urea, creatinine and the activity of liver marker enzymes (SGOT, SGPT and ALP) levels of control and treated rats. The activities of serum antioxidants (CAT, SOD, GPX, GST and GRD) in plant extract treated rats were decreased. The results of the hormonal assay showed that increased serum levels of FSH and estrogen but decreased in the serum levels of LH and testosterone compared to control. The results of fertility test indicated that the treated adult male rats reduced the number of female’s impregnation. In addition, the number of implantations and the number of viable fetuses were also decreased. The results of the present study concluded that, ethanol extract of whole plant of Polygala javana inhibited sperm concentration, motility and testosterone which might result in a male fertility.  

Keywords: Polygala javana, Fertility, Testosterone, Antioxidant.

INTRODUCTION  
Male reproductive toxicology has recently become a rapidly extending area of research and testing. In the last decades there has been growing concern over the effects of either synthetic or natural products on the male reproductive health [1]. Plant preparations play an important role in fertility regulation, a fact that has been reported in the ancient literature of indigenous systems of medicine. A number of plant species have been tested for fertility regulation beginning about 50 years ago and were subsequently fortified by national and international agencies [2, 3]. The role of these indigenous plant products in the induction of male and female fertility in experimental animals has drawn the attention of researchers over the turn of the century [4, 5].

In our country as well as in the world, there are several medicinal plants associated with anti-fertility properties [6, 7, 8]. A large number of plant species with anti-fertility effects have been screened in China and India beginning about 50 years ago and were
subsequently fortified by national and international agencies \cite{9}. However, the search for an orally active, safe and effective plant preparation or its compound is yet to be needed for fertility regulation due to incomplete inhibition of fertility or side effects. Polygala javana belongs to Polygalaceae family. It is commonly known as “Palpiranthi”. Paste prepared from Fresh leaves is applied by Kanikkar tribal woman on the breast twice a day for 2-3 days to check lactation and to get relief from the pain developed while lactating \cite{10}.

In view of the above said medicinal properties, the present study has been designed to investigate the anti-fertility activity of ethanol extract of whole plant of Polygala javana on male albino rats.

**MATERIALS AND METHODS**

**Plant material**

The well grown whole plant of *Polygala javana* DC was collected from Courtallam, Tirunelveli District, Tamil Nadu. The collected plants were identified by the Botanical Survey of India, Coimbatore. A voucher specimen was retained in Ethnopharmacology unit, Research Department of Botany, V.O.Chidambararam College, Tuticorin for further reference.

**Preparation of plant extract**

The whole plants of *Polygala javana* were dried separately under shade and then powdered with a mechanical grinder to obtain a coarse powder, which were then subjected to extraction in a Soxhlet apparatus using ethanol. The ethanol extract were concentrated in a rotatory evaporator. The concentrated ethanol extracts of whole plant of *Polygala javana* were used for anti-fertility activity.

**Animals**

Normal healthy male Wistar albino rats (180-240g) were used for the present investigation. Animals were housed under standard environmental conditions at temperature (25±2°C) and light and Dark (12:12h). Rats were fed with standard pellet diet (Goldmohur brand, MS Hindustan Lever Ltd., Mumbai, India) and water ad libitum. Acute Toxicity Studies
Acute oral toxicity study was performed as per OECD-423 guidelines (acute toxic class method), albino rats of either sex selected by random sampling were used for acute toxicity study. The animals were kept fasting for overnight and provided only with water, after which the extracts were administered orally at 5mg/kg body weight by gastric incubations and observed for 14 days. If mortality was observed in two out of three animals, then the dose administered was assigned as toxic dose. If mortality was observed in one animal then the same dose was repeated again to confirm the toxic dose. If mortality was not observed, the procedure was repeated for higher doses such as 50, 100 and 2000 mg/kg body weight.

Experimental Design

The male rats were divided into 3 groups consisting of 5 animals.

Group I: Rats received normal saline daily for 14 days, orally. (Normal control).

Group II: Rats received ethanol extract of whole plant of Polygala javana at the dose of 100mg/kg body weight daily for 14 days.

Group III: Rats received ethanol extract of whole plant of Polygala javana, at the dose of 200mg/kg body weight daily for 14 days.

After 24 hours of last treatment, the final weight was recorded and the animals were sacrificed by decapitation. Blood was collected. Sera were separated by centrifugation at 3000g for 10 minutes and stored at 20°C until used for various biochemical assays. Then testes, epididymis, vas deferens, seminal vesicle and ventral prostrate were dissected out, trimmed off extraneous and weighed accurately on torsion balance. The organs weights were expressed in terms of mg/100g body weight.

Sperm count

Epididymal fluid (for sperm count) was collected from caput and cauda segments separately and diluted with Sorenson’s buffer (pH 7.2). The separated fluid was taken for sperm count. Sperm count was carried out by using Neubauer’s haemocytometer as described by Zaneveld and Pelakoski.

Sperm motility and abnormality

After anaesthetizing the rats, the caudal epididymis was then dissected. An incision (about 1mm) was made in the caudal epididymis and drops of sperm fluid were squeezed
onto the microscope slide and 2 drops of normal saline were added to mobilize the sperm cells. Epididymal sperm motility was then assessed by calculating motile spermatozoa per unit area.

Morphology (abnormality) was evaluated on sperm from the caudal epididymis. The total morphological abnormalities were observed as described by Linde et al.\[13\].

**Serum biochemical analysis**

Serum proteins\[14\] and serum albumins were determined by quantitative colorimetric method by using bromocresol green. The total protein minus albumin gives the globulin, urea\[15\], creatinine\[16\], serum glutamate pyruvate transaminase (SGPT) and serum glutamate oxaloacetate transaminase (SGOT) was measured spectrophotometrically by using the method of Reitman and Frankel\[17\]. Serum alkaline phosphatase (ALP) was measured by the method of king and Armstrong\[18\].

**Serum antioxidants**

Serum antioxidant Catalase (CAT)\[19\], Superoxidedismutase (SOD)\[20\], Glutathione peroxidase (GPX)\[21\], Glutathione s-transferase (GST)\[22\] and Glutathione reductase (GRD)\[23\] were analyzed.

**Hormonal Assay**

Blood removed from the rats by intracardiac method. Blood was centrifuged at 3000 rpm to separate the serum for the measurement of testosterone, Luteinizing hormone (LH), estrogen and follicle stimulating hormone (FSH). The quantitative determination of hormones was done by using Enzyme Immunoassay Method (EIA). The EIA kit was obtained from Immunometrics (London, UK).

**Fertility test**

Fertility was estimated in adult male rats treated with ethanol extracts of whole plant of *Polygala javana* and in the control male counterparts. Each male was placed in an individual cage with two virgin untreated females of the same strain. They were left together for 10 days during which two estron cycles had elapsed. One week after the removal of the exposed males, pregnant females were killed by cervical dislocation under light ether anesthesia and the number of implantation sites, the number of fetuses and the number of resorption sites were recorded\[24\].
Statistical Analysis

Data were expressed as Mean ± SEM. Student’s t test was used for statistical comparison.

RESULTS

Body weight and reproductive organ weight

Table-1 shows the effects of intra-gastric administration of Polygala javana caused decrease in body weight were compared with control. The weight of testes, epididymis, seminal vesicle, ventral prostrate and vas deferens were found to be significantly decreased in treated male rats when compared with the weight of the same organs obtained from control rats.

**TABLE 1: EFFECT OF POLYGALA JAVANA WHOLE PLANT EXTRACT ON THE BODY AND REPRODUCTIVE ORGAN WEIGHT OF ADULT MALE ALBINO RATS.**

<table>
<thead>
<tr>
<th>Treatment Groups</th>
<th>Body wt (gm) Before</th>
<th>After</th>
<th>Testis (gm)</th>
<th>Epididymis (mg) Caput</th>
<th>Cauda</th>
<th>VD (mg)</th>
<th>SV (mg)</th>
<th>Prostrate (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group-I</td>
<td>192.54 ±8.34</td>
<td>196.51±9.53</td>
<td>2.056±0.32</td>
<td>126.39±5.94</td>
<td>231.59±8.33</td>
<td>102.39±3.22</td>
<td>253.16±10.24</td>
<td>156.54±7.43</td>
</tr>
<tr>
<td>Group-II</td>
<td>190.34 ±6.38</td>
<td>174.38±5.26*</td>
<td>1.806±0.18*</td>
<td>111.33±1.11*</td>
<td>214.26±6.59</td>
<td>96.74±2.14*</td>
<td>224.50±8.24</td>
<td>138.36±3.98</td>
</tr>
<tr>
<td>Group-III</td>
<td>188.56 ±7.33</td>
<td>168.54±5.16**</td>
<td>1.721±0.29**</td>
<td>102.53±1.21**</td>
<td>204.16±7.33</td>
<td>81.63±2.84*</td>
<td>219.47±9.16</td>
<td>131.69±4.33</td>
</tr>
</tbody>
</table>

Each Value is SEM of 5 animals * P < 0.05; ** P < 0.01. Control vs. Treated

Sperm count and sperm motility

Sperm motility and sperm density in caudal epididymis, significantly decreased and the reduction was severe in higher dose treated group (Group-III) followed by low dose group (Group-II) (Table-2) and the same trend was seen in the caput epididymal sperm density when compared to control (Group-I).
**TABLE 2: EFFECT OF POLYGALA JAVANA WHOLE PLANT EXTRACT ON THE SPERM CONCENTRATION AND MOTILITY IN THE EPIDIDYMIS OF ADULT MALE ALBINO RATS.**

<table>
<thead>
<tr>
<th>Treatment Groups</th>
<th>Sperm Concentration (Counts x 10^6 mil)</th>
<th>Sperm Motility (FMI) @ (cauda)</th>
<th>Sperm Abnormality #</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>caput</td>
<td>cauda</td>
<td>Head (%)</td>
</tr>
<tr>
<td>Group-I</td>
<td>293.41±10.56</td>
<td>349.33±12.14</td>
<td>143.68±7.36</td>
</tr>
<tr>
<td>Group-II</td>
<td>254.84±9.76**</td>
<td>312.16±9.38**</td>
<td>128.30±4.76**</td>
</tr>
<tr>
<td>Group-III</td>
<td>229.56±9.36***</td>
<td>291.49±10.27**</td>
<td>114.91±5.33**</td>
</tr>
</tbody>
</table>

Each Value is SEM of 5 animals * P < 0.05, ** P<0.01, *** P<0.001 Control vs. Treated

@ : Motility is movement recorded after 5 min in suspension of caudal epididymal spermatozoa in phosphate buffered solution.

#: Expressed in percentage

**Serum biochemical profile**

Serum protein, albumin, globulin, urea, creatinine and the activity of liver marker enzymes (SGOT, SGPT and ALP) levels of control and treated rats were depicted in table-3. Except, protein, albumin and globulin all the other parameters were significantly increased.

**TABLE 3: EFFECT OF POLYGALA JAVANA WHOLE PLANT EXTRACT ON FEW SERUM BIOCHEMICAL AND ENZYME PROFILE OF ADULT MALE ALBINO RATS.**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Treatment Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Group I</td>
<td>Group II</td>
</tr>
<tr>
<td>Protein</td>
<td>gm/dl</td>
<td>8.14±0.29</td>
</tr>
<tr>
<td>Albumin</td>
<td>gm/dl</td>
<td>4.36±0.43</td>
</tr>
<tr>
<td>Globulin</td>
<td>gm/dl</td>
<td>3.78±0.16</td>
</tr>
<tr>
<td>Urea</td>
<td>(mg/dl)</td>
<td>11.27±0.91</td>
</tr>
<tr>
<td>Creatinine</td>
<td>(mg/dl)</td>
<td>0.63±0.04</td>
</tr>
<tr>
<td>SGOT</td>
<td>(U/L)</td>
<td>16.96±1.13</td>
</tr>
<tr>
<td>SGPT</td>
<td>(U/L)</td>
<td>21.73±1.63</td>
</tr>
<tr>
<td>ALP</td>
<td>(U/L)</td>
<td>133.61±6.27</td>
</tr>
</tbody>
</table>

Each Value is SEM of 5 animals * P < 0.05, Control vs. Treated
Serum antioxidants

The activities of CAT, SOD, GPX, GST and GRD in the serum of control and plant extract treated rats were presented in Table-4. In the present study, plant extract treated rats had shown decreased activities of all the studied antioxidants when compared to control rat.

**TABLE 4: EFFECT OF POLYGALA JAVANA WHOLE PLANT EXTRACT ON THE ACTIVITY OF SERUM CATALASE, GLUTATHIONE PEROXIDASE, GLUTATHIONE-STRANSFERASE, SUPEROXIDEDISMUTASE AND GLUTATHIONE REDUCTASE IN RATS**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catalase</td>
<td>8.56±0.24</td>
<td>6.38±0.12*</td>
<td>5.91±0.16*</td>
<td>moles of ( \text{H}_2\text{O}_2 ) decomposed/min/mg protein</td>
</tr>
<tr>
<td>Glutathione peroxidase</td>
<td>0.41±0.05</td>
<td>0.28±0.03*</td>
<td>0.19±0.02**</td>
<td>moles of NADPH oxidized/min/mg protein</td>
</tr>
<tr>
<td>Glutathione-S-transferase</td>
<td>9.13±1.04</td>
<td>7.30±0.56*</td>
<td>6.22±0.84*</td>
<td>moles of conjugate formed/min/mg protein</td>
</tr>
<tr>
<td>Superoxide dismutase</td>
<td>24.91±2.11</td>
<td>16.32±0.78*</td>
<td>13.49±1.31*</td>
<td>Units/L</td>
</tr>
<tr>
<td>Glutathione reductase</td>
<td>16.24±0.91</td>
<td>12.34±0.36*</td>
<td>8.89±0.68*</td>
<td>moles of NADPH oxidized/min/mg protein</td>
</tr>
</tbody>
</table>

Each Value is SEM of 5 animals * P < 0.05, ** P<0.01 Control vs. Treated; NS-non significant

Reproductive hormone level

Serum testosterone level

The ethanol extract of whole plant of Polygala javana (100 and 200 mg/kg body weight) repeated treatment for 14 days caused a significant decrease in serum level of testosterone in male rats. The level of testosterone decrease was dose related (Table-5)
TABLE 5: EFFECT OF POLYGALA JAVANA WHOLE PLANT EXTRACT ON SEX HORMONES LEVELS AND PITUITARY GONADOTROPHINS IN MALE ALBINO RATS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Treatment Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Group I</td>
</tr>
<tr>
<td>Testosterone</td>
<td>ng/ml</td>
<td>2.94±0.89</td>
</tr>
<tr>
<td>LH</td>
<td>μIu/ml</td>
<td>1.99±0.58</td>
</tr>
<tr>
<td>Estrogen</td>
<td>pg/ml</td>
<td>18.51±1.63</td>
</tr>
<tr>
<td>FSH</td>
<td>μIu/ml</td>
<td>1.98±0.17</td>
</tr>
</tbody>
</table>

Each Value is SEM of 5 animals * P < 0.05, ** P<0.01 Control vs. Treated

Serum luteinizing hormone (LH) level
Repeated treatment of male rats with the ethanol extract of whole plant of Polygala javana for 14 days caused a dose related decrease in the serum level of LH.

Serum Estrogen level
The ethanol extract of whole plant of Polygala javana at the dose of 100 mg/kg body weight caused an increase in the level of estrogen in male rats.

Serum Follicle Stimulating Hormone (FSH) level
Pre-treatment with the ethanol extract of whole plant of Polygala javana caused an increase in the serum level of FSH male rats compared to control.

Fertility test
The results presented in table-6 shows that intra-gastric administration of the ethanol extract of whole plant of Polygala javana at dose 200 mg/kg body weight for 14 days to male rats caused a significant decrease in the number of females impregnated by male treated rats. The number of implantations and the number of viable fetuses calculated after cesarean suctions were significantly decreased in female rats impregnated by treated males when compared with females impregnated with untreated rats. On the other hand
the number of resorption sites were found to be increased to a significant values in females impregnates by treated male rats when compared to controls.

**TABLE 6: EFFECT OF POLYGALA JAVANA WHOLE PLANT EXTRACT ON THE FERTILITY OF MALE ALBINO RATS**

<table>
<thead>
<tr>
<th>Groups</th>
<th>No. of male</th>
<th>No. of females</th>
<th>No. of pregnant females</th>
<th>No. of implantation</th>
<th>No. of viable fetuses</th>
<th>Total no of resorption sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group-I</td>
<td>2</td>
<td>6</td>
<td>6/6 (100%)</td>
<td>12.21±2.05</td>
<td>6.74±1.21</td>
<td>2</td>
</tr>
<tr>
<td>Group-II</td>
<td>2</td>
<td>6</td>
<td>3/6 (50%)</td>
<td>6.36±1.23*</td>
<td>4.31±0.76*</td>
<td>3</td>
</tr>
<tr>
<td>Group-III</td>
<td>2</td>
<td>6</td>
<td>2/6 (33%)*</td>
<td>4.70±1.35*</td>
<td>3.26±0.94*</td>
<td>4</td>
</tr>
</tbody>
</table>

Each Value is SEM of 5 animals * P < 0.05 Control vs. Treated

**DISCUSSION**

Studies on the effects of plant products on male reproductive system and fertility are comparatively few and far fetched. From a public health perspective, the head for contraception has never been greater.

The results revealed slight changes in the body weight of rats treated with ethanol extract of whole plant of *Polygala javana* (100 and 200 mg/kg body weight) for 14 days. The testes and other accessory sex organs, a significant weight reduction were seen in the testes, caput and caudal epididymal segments and the weight reduction was dose dependent. Reduction in the weight of testes and other accessory sex organs might be due to low level of androgen, which was not enough to maintain the weight of gonads and accessories [25]. It is known that the accessory sex organs viz., epididymis and vas deferens are androgen dependent target organs and manifest differential sensibility to androgens for maintenance of their structure and function. It is also known that, any
change in circulating androgens would affect the internal microenvironment of epididymis and thereby lead to alteration in sperm motility and metabolism\textsuperscript{[26]}. In the present study, ethanol extract of whole plant of \textit{Polygala javana} treated rats decreased the sperm motility and sperm density in caudal and caput epididymal segments (Table2). Drastic effect on the nature of the normal sperms in the caput and caudal region was observed in ethanol extract of whole plant of \textit{Polygala javana} treated rats. Further tail region of the sperm in all the treated groups (Group-II & Group-III) were much affected than the head regions (Table-2). The development of normal and mature sperm is the key to optimum male fertility. The production of the sperm cells (spermatozoa) and testosterone in the testes are mainly regulated by the follicle stimulating hormone (FSH) and luteinizing hormone (LH), which are released from the anterior pituitary\textsuperscript{[27]}. FSH stimulates spermatogenesis in the steroli cells, while LH simulates the production of testosterone in the leydig cells of the testes\textsuperscript{[28]}. Many studies on the testes of rat treated with plant extracts has also demonstrated that the inhibitory activity on the proliferation of spermatogonia in mammals\textsuperscript{[29, 30, 31]}. Spermatogenesis is therefore, a complicated process, covering proliferation of the spermatogonia, long-lasting process of the tissue meiosis and numerous changes in the spermatids during their pre-formation. The result of the present study suggest that ethanol extract of whole plant of \textit{Polygala javana} for 14 days may affect the normal function of the steroli and leydig cells. Sexual cells can occur during the reproductive phase, mitotic division of the spermatogonia or during the maturation of the spermatozoa, thereby affecting the number and quality of the sperm cells produced in the testes. Among the ethanol extract treated groups II and III (100 and 200mg/kg body weight) produced a significant reduction in the sperm count and viable sperms. This may be as a result of the ability of the extract at the given doses, to either interfere with spermatogentic process in the somniferous tubules, epididymal functions or activities of testosterogenic on hypothalamic release factor and anterior pituitary secretion of gonadotropins which may result in alteration of spermatogenesis\textsuperscript{[32, 33]}. The presence of immature sperms was also observed in the experimental rats treated with ethanol extract of whole plant of \textit{Polygala javana} (100 and 200 mg/kg body weight). This suggests that the 100 mg/kg body weight and 200 mg/kg
body weight dose level could affect the maturation of the spermatozoa in the male rats, which might also be a contributory factor to the decrease in the mean total sperm count. The data generated in the present study, by and large, confirm to those already reported and studied with various plant extracts\textsuperscript{[34, 35, 36]}. The decrease in the caudal epididymal sperm counts are clear indications that, the ethanol extract of whole plant of \textit{Polygala javana} can affect one or more aspects of spermatogenesis as well as spermigenesis. Though a direct effect of the ethanol extract of whole plant of \textit{Polygala javana} on the cellular mechanisms of spermatogenesis cannot be concluded, it is likely that the impairment of the hormonal mechanisms concerned with the regulation of spermatogenesis may be the underlying cause.

The various other sperm abnormalities like sluggish motility, coiled tail and sperm maturation are also due to \textit{Polygala javana} toxicity. The hitherto unreported abnormal sperm methodology, coiled tail and malformed head could be attributed to both testicular and epididymal effects of the ethanol extract of whole plant of \textit{Polygala javana}. Coiling of the sperm tail is usually the product of abnormal axoneme and/or the other dense fibril. The outcome of the present study affirms the male reproductive toxic effects of \textit{Polygala javana} when applied as a therapeutic agent. Since male reproductive toxicology and male contraception are two sides of the same coin, the negative consequence of \textit{Polygala javana} on the sperm may be taken as an advantage for further study. By the treatment employed in the study, no toxic effect was produced in the liver and kidney, neither was it directly involved on the development and functioning of the male reproductive system nor in the reproductive organs.

Superoxide dismutase (SOD) scavenges both extracellular and intracellular superoxide anion and prevents lipid peroxidation of the plasma membrane. In order to act against \textit{H}_2\textit{O}_2 it must be conjucated with catalase or glutathione peroxides\textsuperscript{[37]}. The reduced level of catalase, glutathione peroxidase, glutathione s-tranferase and glutathione reductase might be due to the excess production of anions in response to the ethanol extract of whole plant extract of \textit{Polygala javana}. It is possible that an increased rate of ROS production may inhibit the action of these antioxidant enzymes or alternatively the decreased expression of these antioxidant enzymes may cause increased oxidative stress.
This will result in increased LPO, decreased sperm motility, viability and function, an ultimately leads to infertility.

The present study revealed a decrease in the serum level of testosterone. This observation was similar to the earlier findings of [39, 40, 41]. The reduction in the serum level of testosterone could probably be due to the decrease of serum levels of LH/ICSH observed in this investigation. Leydig cells secrete testosterone by the stimulatory effect of LH [42, 43]. In males reduction of testosterone level may impair spermatogenesis and cause male infertility. This study further observed a dose dependent increase in the serum estrogen level. This increase might probably be due to the conversion of testosterone to estrogen [44, 45].

Treatment with the ethanol extract of whole plant of Polygala javana (100 and 200mg/kg body weight) was highly effective in producing reversible functional sterility. The drug treated male rats clearly indicated structural and functional alteration in testes, epididymis and seminal vesicle. Depletion of sperm count and sperm motility in the drug treated rats suggests alteration in sperm motility resulted in partial infertility within 14 days. This resulted in abnormal sperm functions which ultimately gave rise to complete male sterility. Among the plant based contraceptives, inhibition of male fertility after administration of natural substances has been related to decreased spermatozoa density [46]. For male contraception, it is not necessary to stop spermatogenesis, but it is enough to eliminate the fertilizing ability of the spermatozoa by causing changes in the morphology or in the function of the sperm [47].

In the present study, a significant decrease in the sperm density and motility was observed in the cauda epididymus in the entire treatment group, which lead to proven in the impairment of fertility in all the treated groups. The results presented in this study also indicated that the treatment with the ethanol extract of whole plant of Polygala javana by adult male rats reduces the number of female’s impregnation. In addition, the number of implantations and the number of viable fetuses were also decreased; this could be reflected and may be due to the decrease in sperm motility and sperm density observed in this study. Hence, this may be due to the effects of the given plant extracts on the enzymes involved in the oxidative phosphorylation.
From the present study it can be concluded that *Polygala javana* is capable to suppress male fertility without altering general metabolism. Hence the possible male contraceptive efficacy of *Polygala javana* whole plant extract cannot be ignored paving way to the smooth development for the clinicians’ interests in clinical trials towards emergence of a potent herbal male contraceptive.

Recently many laboratories are engaged in developing male contraceptives from plants [48]. Plant products as contraceptives will be more acceptable for economic reasons in terms of self reliance and the possible practicability for a male pill approach in countries where population pressure is high. Recently extensive effects have been made to study the anti-fertility drugs from plants [49, 50]. In the present study, dose dependent treatment of *Polygala javana* whole plant extract and duration suggests marked alterations in the male reproductive organs. Further studies are needed to prove whether the alterations are reversible or permanent after cessation of treatment and for understanding the extract mechanism.

**ACKNOWLEDGEMENT**

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