First description of chromosomes in *Pyrgomorpha vignaudii* (Orthoptera: Pyrgomorphidae) collected from Cameroon

BY SEINO RA$^{1,2}$ and DONGMO TI$^2$

$^1$Department of Biological Science, Faculty of Science, The University of Bamenda, P.O. Box 39, Bambili – Bamenda, Cameroon

$^2$Department of Animal Biology, Faculty of Science, University of Dschang, P.O. Box 67, Dschang, Cameroon

Correspondence email: dongmotonleu87@yahoo.fr

ABSTRACT

The karyotype and meiotic process in *Pyrgomorpha vignaudii* (Orthoptera: Pyrgomorphidae) are here described for the first time. Karyotypes were obtained from colchicine treated individuals of the species by the standard Lacto-propionic Orcien squash technique. The species revealed a karyotype of 2n = 19 acrocentric chromosomes in males and the XX – XO sex determining mechanism. The chromosomes were distributed into two long, six medium and one short chromosome (2LL: 6MM: 1SS). The X chromosome was medium in size. Meiosis was normal and chiasmate. The information here provided increases the cytogenetic data base for Cameroonian Pyrgomorphidae.

Key words: Karyotype, meiosis, *Pyrgomorpha vignaudii*, Orthoptera, Pyrgomorphidae, Cameroon

INTRODUCTION

The karyotype of a vast majority of Pyrgomorphidae reported in literature reveal a diploid complement of 2n (♂) = 19 acrocentric chromosomes. Though this family shows a high degree of karyotype stability, some cases of deviation from the fundamental 2n (♂) = 19 acrocentric chromosomes have been reported in a number of species. Three South African species have been reported to show 2n (♂) = 18 (result of an X – autosome fusion), 15 (two autosomal fusions) and 11 (four autosomal fusions) [1]. The South African *Pyrgomorpha* species: *P. rugosa* and *P. granulata* show reduced chromosome numbers due to centric fusions between the largest autosomes and the medium and small autosomes [5]. Accordingly, *P. rugosa* has 2n (♂) = 11(XO) (4 pairs of submetacentrics and 1 pair of acrocentric chromosomes while *P. granulata* has 2n (♂) = 13 (XO) (3 pairs of submetacentrics and 3 pairs of acrocentric autosomes). In this paper, we report a first description of karyotype (chromosome number and morphology) in the Cameroonian *Pyrgomorpha vignaudii* (Orthoptera: Pyrgomorphidae) which is part of a survey to build a cytogenetic data base for Cameroonian Pyrgomorphidae.

MATERIALS AND METHODS

Five adult male individuals of *P. vignaudii* were collected from natural populations in Dschang, in the Menoua Division of the West region in Cameroon. They were injected with 0.01ml of 5% colchicine and incubated for eight hours before being killed in chloroform fumes and dissected for the testes. The testes obtained were fixed in Canoy’s solution (one part of acetic acid and three parts of ethanol) for 8 hours at room temperature. The testes were then preserved in a refrigerator at 4°C until needed.

http://www.journalzbr.com/issues.html
During this study, lacto-propionic orcien squash preparations were made [6]. Photographs of mitotic and meiotic chromosomes were made with the Lietz photomicroscope using the oil immersion lens, (100X) and immersion oil was applied to the preparation. Chromosome morphology was determined from the position of the centromere in mitotic chromosomes and the shapes of chromosomes in Meiotic anaphases [7].

**RESULTS**

Fig. 1a shows mitotic Metaphase with 19 chromosomes. The chromosomes are rod-shaped with sister chromatids separated gradually from a tapered end towards the other end. Constrictions were visible towards the tapered ends in some chromosomes inferring the positions of the centromeres. Also, in some of the chromosomes short minute arms were visible. The chromosomes in *P. vignaudii* were judged to be acrocentric in morphology [8].

The karyotype (Fig. 1 b) prepared from mitotic chromosome smears revealed the chromosomes to occur in three size groups of long, medium and short. The karyotype revealed that the species *P. vignaudii* possessed two long, six medium and one short chromosome (2LL: 6MM: 1SS). The sex or X- chromosome was medium in size.

Fig. 2 shows meiotic stages in *P. vignaudii* which included: Prophase 1 (Zygotene, Pachytene, and Diplotene), Metaphase 1, Anaphase 1, Metaphase 2 and Anaphase 2. Prophase 1 was chiasmate and showed both rod- and ring-shaped bivalents in Diplotene (Fig. 2c). Metaphase 1(Fig. 2 d) showed 9 bivalents and 1 univalent. The univalent was the sex or X - chromosome. In Anaphase 1 (Fig. 2 e), the chromosomes were V- shaped and single stranded, while in Anaphase 2 (Fig. 2 g) the chromosomes were rod shaped. The chromosomes in *P. vignaudii* were therefore judged to be acrocentric in morphology [7]. The X-chromosome stained darker than the autosomes in Prophase 1 (Fig. 2 a-c) being heteropycnotic while in Metaphase 1(Fig. 2d) the X-chromosome had a smooth outline and stained lighter than the autosomes.

![Fig. 1. Mitotic chromosomes in *Pyrgomorpha vignaudii*. a) Mitotic metaphase chromosomes. Minute short arms are visible in some chromosomes and arrows show positions of centromeres. **Bar represents 3µm**, b) karyotype showing the different chromosomes in the size groups of long, medium and short.](http://www.journalzbr.com/issues.html)
Fig. 2. Meiotic stages in *Pyrgomorpha vignaudi*. Arrows in zygotene, pachytene, diplotene show the positively heteropycnotic X-chromosome and arrow in metaphase -1 indicates the negatively heteropycnotic X-chromosome. Arrows in anaphase-1 indicate possible positions of the centromeres. *Bar represents 2μm.*

**DISCUSSION**

The karyotype and meiosis of *Pyrgomorpha vignaudi* (Orthoptera: Pyrgomorphidae) is described here for the first time. The species has a karyotype that included 2n = 19(♂) with the XX (♀) – XO (♂) sex determining mechanism. The chromosomes in the species were acrocentric in morphology. The typical Pyrgomorphidae karyotype made up of 2n = 19 (♂) acrocentric chromosomes has been reported for species collected in Nigeria, South Africa, South America, Europe and Central Asia [5,9,10,11]. *P. vignaudi* therefore showed cytogenetic uniformity regarding chromosome number, morphology and sex determination mechanism with other Pyrgomorphidae species found in different regions of the world.
The chromosomes in *P. vignaudii* were also distributed into the long, medium and short size groups (2LL: 6MM + X: 1SS). The Orthoptera have been shown to be characterized by chromosomes that occur in three size groups of long, medium and short.[1, 12, 13, 14]. However, the number of chromosomes per size group has been shown to vary with species [15].

The data here presented increases the cytogenetic data base of Cameroonian Pyrgomorphidae.

Acknowledgements

The authors are grateful to Professor MPOAME Mbida, Head of the Laboratory for Biology and Applied Ecology (LABEA), Department of Animal Biology, Faculty of Science, University of Dschang - Cameroon, for laboratory facilities.

REFERENCES