Identification of Cytological and Morphological Characteristics of Some Barley Landraces

Amer. M. Abel Aziz[1]

ABSTRACT

This work was carried out at the Farm of Faculty of Agriculture, Alexandria University. This work was carried out using 16 land races of Barley and 7 characters for plant growth as well as investigation of karyotype were carried out. The obtained data indicated that there are significant differences between the tested land races and fourteen chromosomes were detected in karyotype for each land race. This work recommends the use of these data for the selection and breeding program.

INTRODUCTION

Barley (*Hordeum vulgar* L.) is a major crop ranked fourth in the world-wide production of cereals. It is considered a primary staple food or feed crop in the semi-arid tropics of Asia, Africa, and South America. Th grain is normally used as food and animal fodder, but recently it has been used as raw material for the production of beer. Barley is typically cultivated in the arid and semi-arid regions of Iran generally in areas with low precipitation that are not suitable for wheat (Baik and Ullrich, 2008). Drought is a signifiant limiting factor for agricultural productivity and generally inhibits plant growth through reduced water absorption and nutrient uptake. For improving the drought tolerance of crop varieties by plant breeding, it is necessary to identify genotypes with tolerance to drought stress during all growth stages. Landraces are still cultivated in traditional crop-growing areas (Araus et al, 2008). There is renewed interest in landraces and primitive cultivars as important sources of genetic variation (Brush, 1995 and Rajaram &Ginkle,2001) mainly because of the trend toward greater uniformity that has narrowed the genetic base of modern cultivars, thus increasing their vulnerability to biotic and abiotic stress. Decreased water availability generally results in reduced growth and fial yield in crop plants. Plant drought tolerance is a highly complex trait that involves multiple genetic, physiological and biochemical mechanisms (Baik and Ullrich, 2008; Erdei *et al.,* 2002). Drought affcts morphological, physiological, biochemical and molecular processes in plants resulting in growth inhibition. Th extent of these changes is dependent on the time, stage and severity of environmental stress (Cao *et al.,* 2011). Measurements of diffrent physiological processes of plants responses to drought are important information on the various strategies of the plant intended to remove or to reduce the harmful effcts of water defiit in soil or plant tissues. Water defiit conditions cause water losses within the plant and result in relative water content (RWC) reduction. Threfore, RWC is widely used as one of the most reliable indicators for defiing both the sensitivity and the tolerance of plants to water defiit (Rampino *et al.,* 2006; Sanchez-Rodriguez *et al.,* 2010). Rong-Hua *et al.* (2006) and Farshadfar et al (2012) concluded that chlorophyll content could be considered as a reliable indicator in screening barley genotypes for drought tolerance. Experiments with a host of plants and different photosynthetic metabolism processes, which can be induced by varieties of plants and many biotic and abiotic factors, can directly or indirectly produce modifiation to florescence induction kinetics. In addition, Slapakauskas and Ruzgas (2005) reported that measuring of chlorophyll provides information on quantitative and quantitative changes in photosynthesis.

MATERIALIS AND METHODS

Plant material

Barley (16 landraces) have been investigated under normal conditions and this research was carried out in farm of Faculty of Agriculture Alexandria University and Laboratory of cytogenetics under the help offered by Professor Mohammed El-Seehy.

Morphological Identification:

For the 16 different genotyped were carried out. These characters are (Growth habit, The presence of hairs on the lower leaves sheath, The degree of discoloration auricles flag leaf to Anthocyanin, The percent of the curved flag leaves, The presence of wax on neck the flag leaf, The presence of wax on the stem and Covers grain).

Cytological examination was carried after germination of seeds and when roots with 1-2 cm long were obtained. The root tips collected from these seeds were fived in ethanol and glacial acetic acid 3:1.

Preparation of chromosomes:

The fived root-tips were thoroughly washed with distilled water, hydrolysed with 5 M HCL at 29^{o}C for 30 min., then they were washed and transferred into vial samples containing basic-fuchsin, p^{H} 2.4 for 3hrs., washed with distilled water, transferred to 45% acetic acid and examined Seehy (1989).

[1]Genetic Resources Research Department Field Crops Research Institute, ARC- Giza , Cairo
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RESULTS AND DISCUSSION

The results obtained indicated that there was no differences between the different genotypes at the level of chromosome number and, since the chromosome number was found to be 14 chromosome. However heteropecknosis were found to be in some genotypes but not in the other. Such a result, however, might indicate that differential gene expression was detected. (Seehy 1990) As shown in table (1).

Table 1.

Genotype	Chromosome Number	Genotype	Chromosome Number
1-7543	14	9-7458	14
2-7436	14	10-7466	14
3-7440	14	11-7471	14
4-7441	14	12-7476	14
5-7442	14	13-7479	14
6-7450	14	14-7483	14
7-7452	14	15-7485	14
8-7454	14	16-7489	14

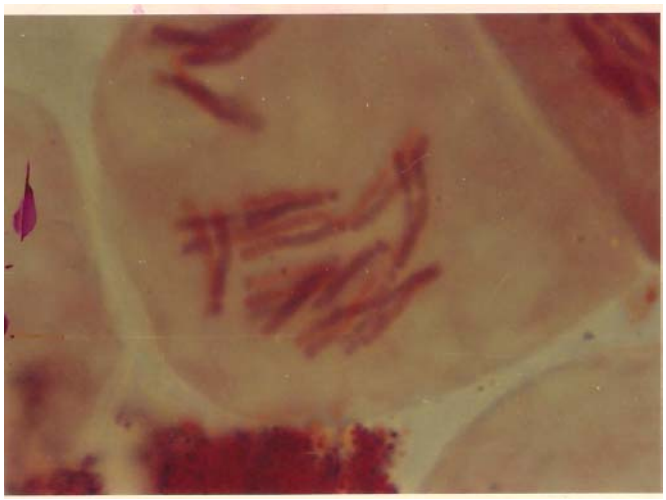

Figure 1. Photomicrograph showing Hetero peknosis.

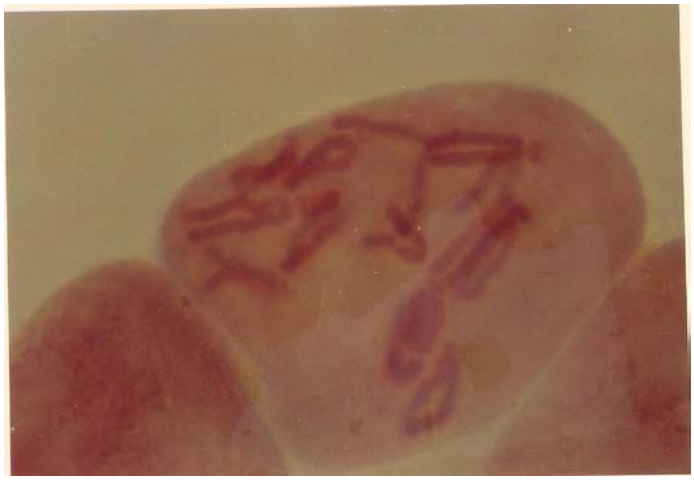

Figure 2. Photomicrograph showing metaphase polar view with high degree of stikiness.

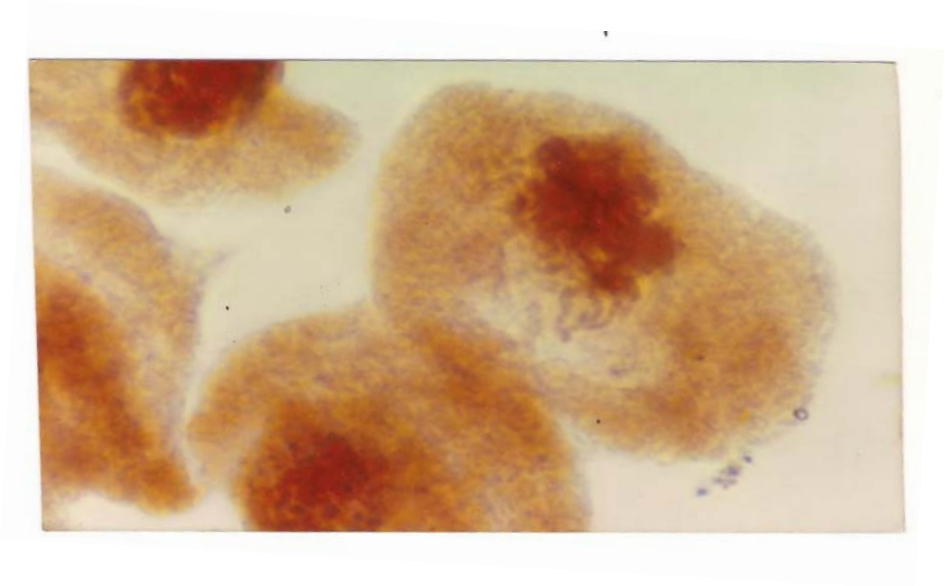

Figure 3. Photomicrograph showing metaphase stage with fragments.

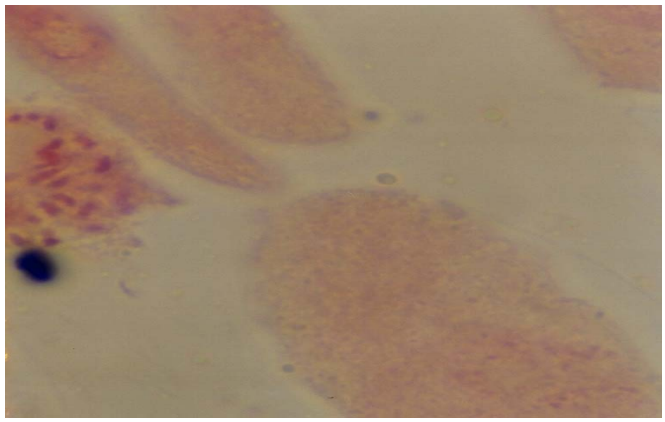

Figure 4. Photomicrograph showing metaphase stage showing metaphase polar view.

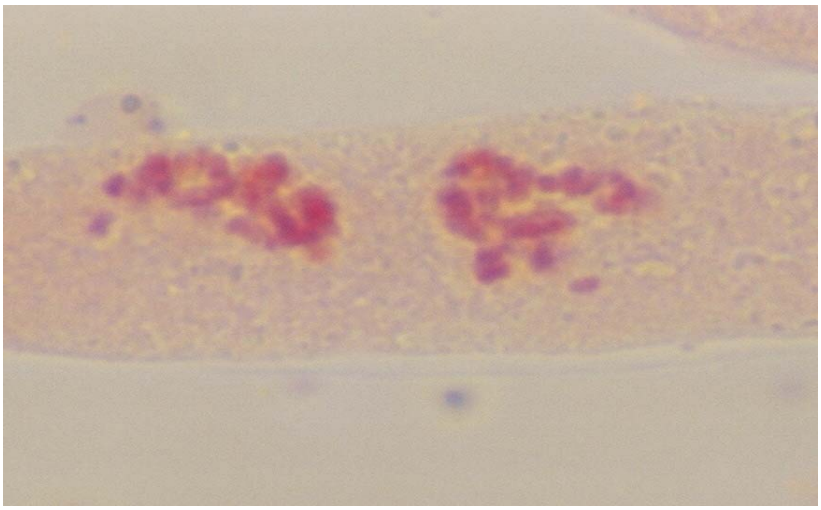

Figure 5. Photomicrograph showing metaphase stage with polar view (polyploidy).

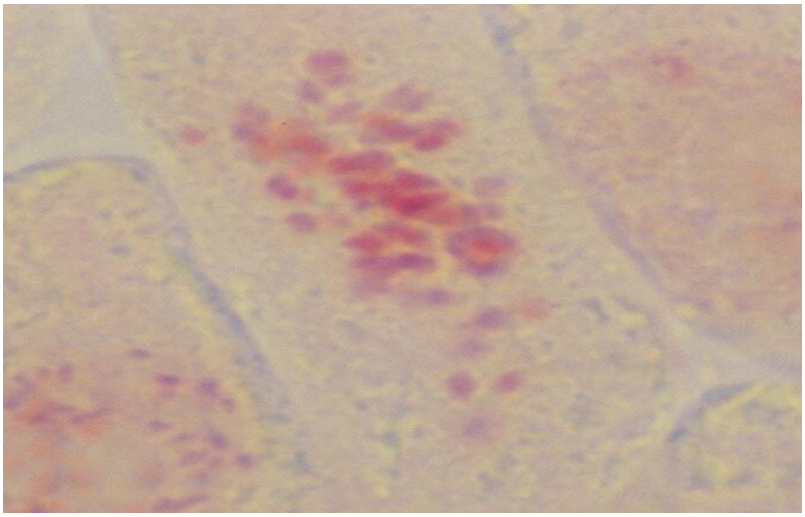

Figure 6. Photomicrograph showing metaphase stage showing diploid chromosome number.

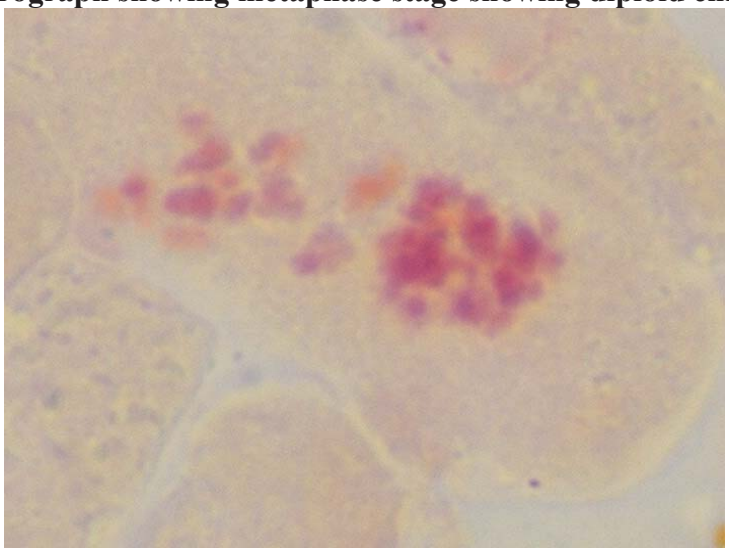

Figure 7. Photomicrograph showing metaphase stage showing two chromosome complement.

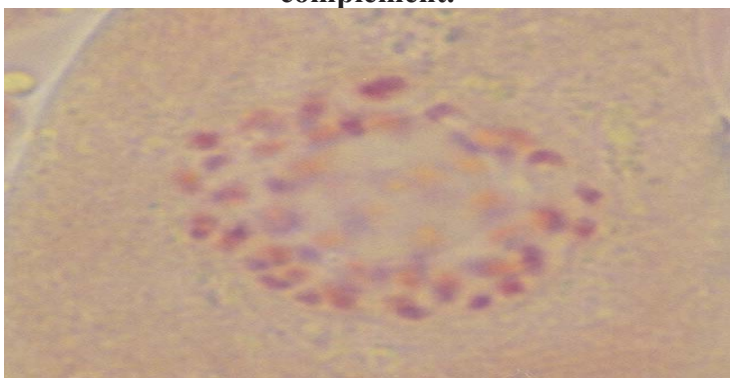

Figure 8. Photomicrograph showing metaphase stage showing chromosome with stickiness and fragment.

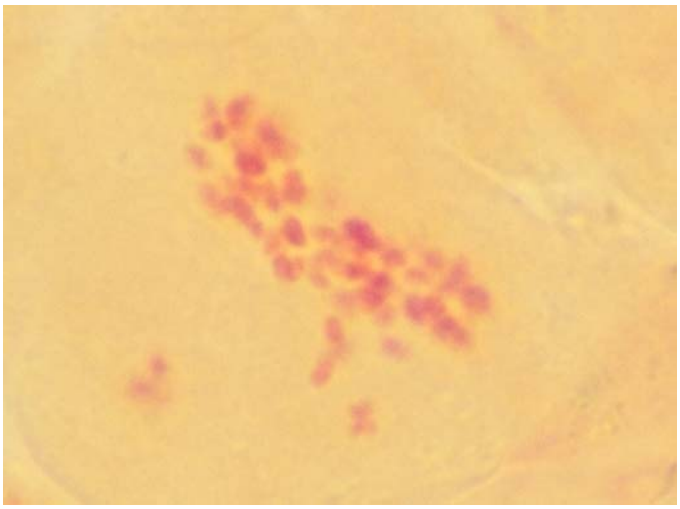

Figure 9. Photomicrograph showing metaphase stage showing stickiness and fragment.

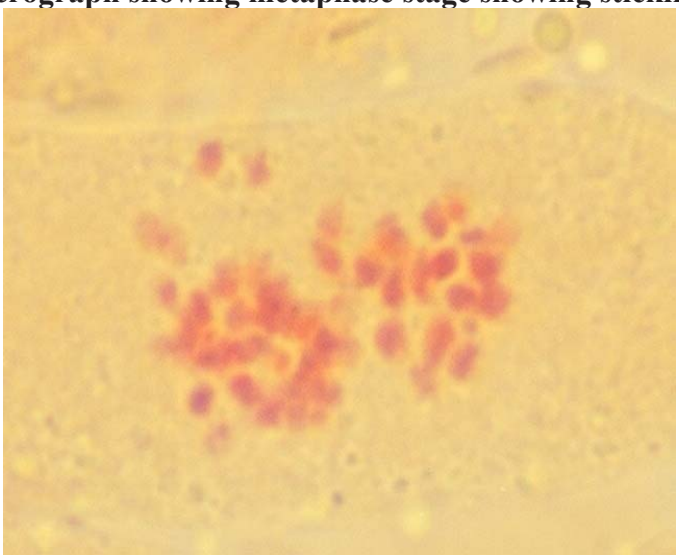

Figure 10. Photomicrograph showing metaphase stage with hyperpolid.

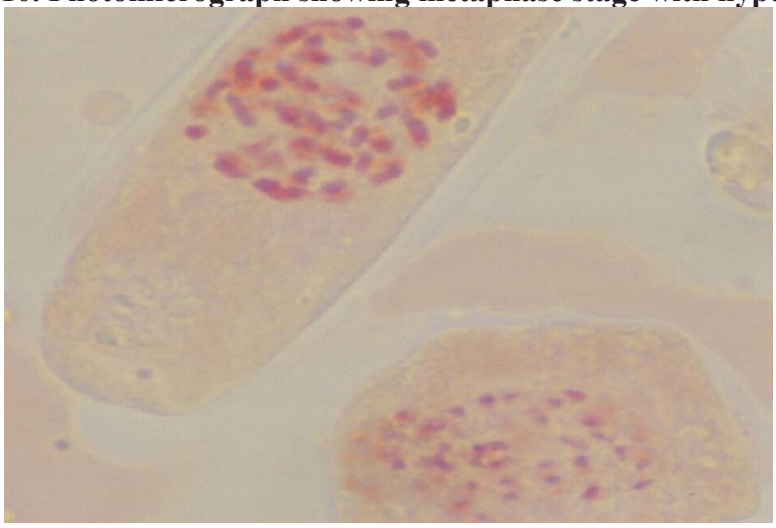

Figure 11. Photomicrograph showing Interphase neucleus.

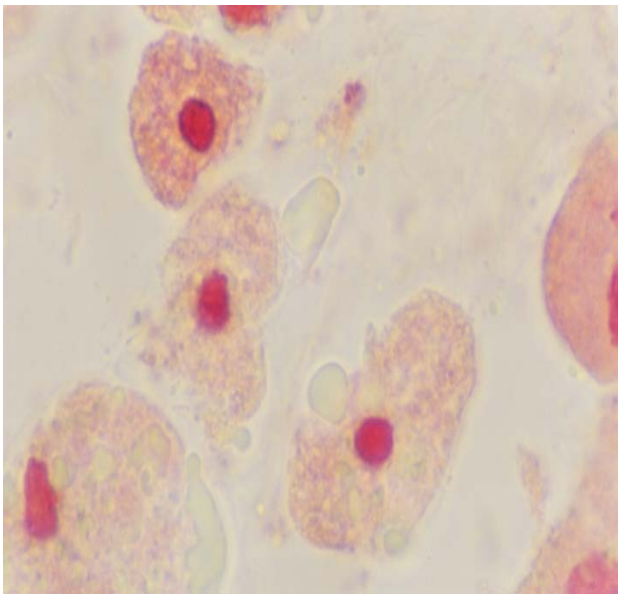

Figure 12. Photomicrograph showing Interphase with heterochromatin

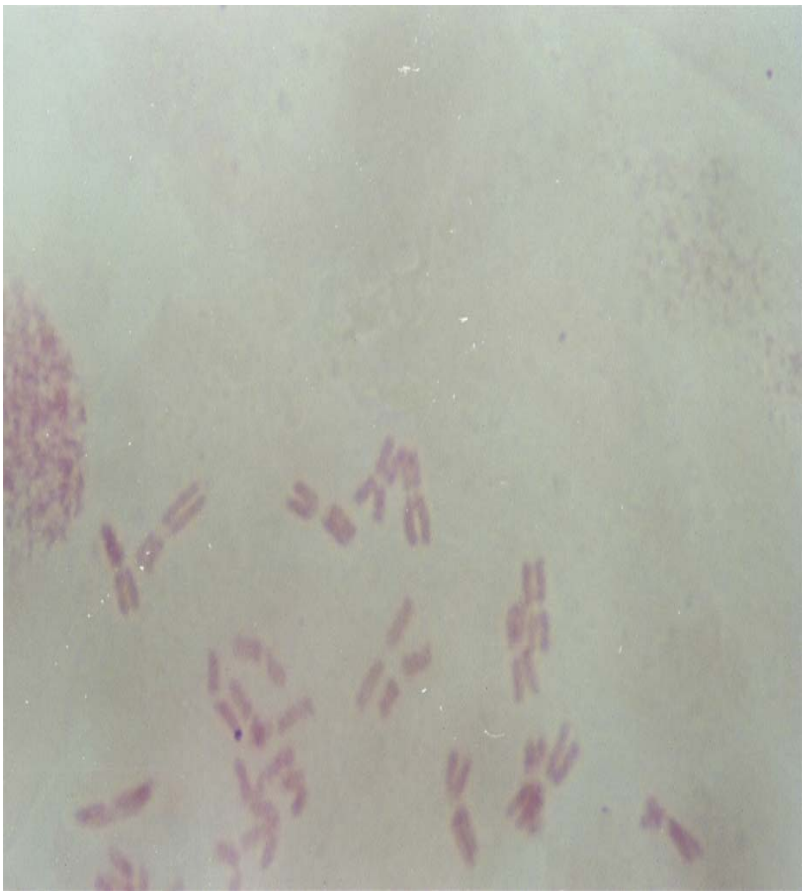

Figure 13. Photomicrograph showing chromosome complement at metaphase stage.

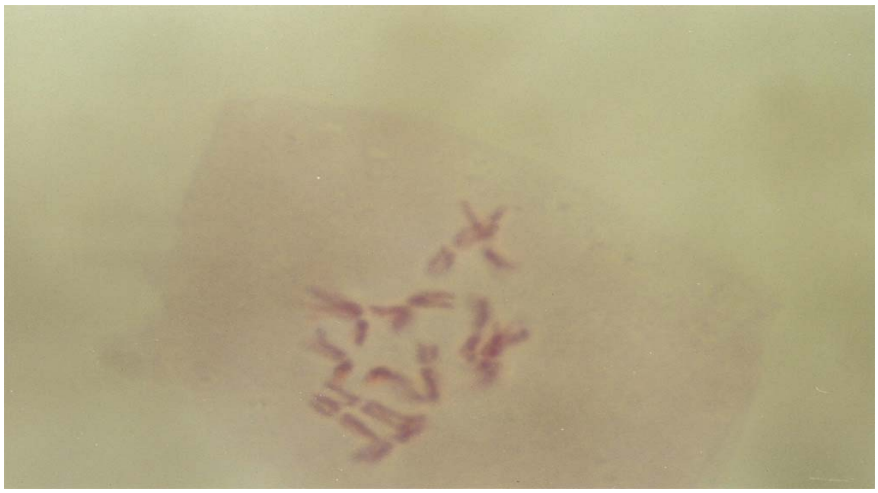

Figure 14. Photomicrograph showing metaphase stage.

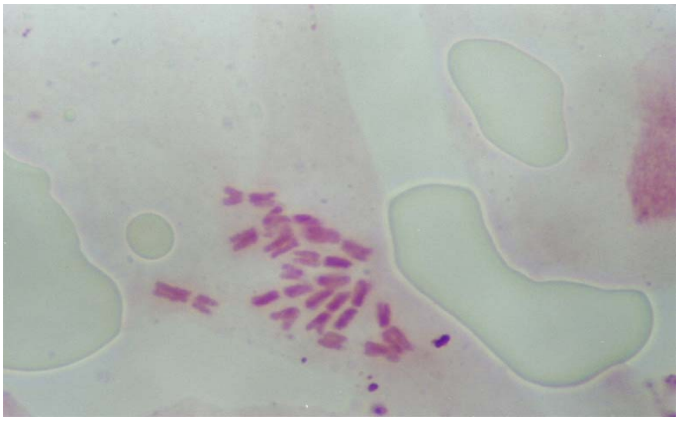

Figure 15. Photomicrograph showing metaphase stage with stickiness.

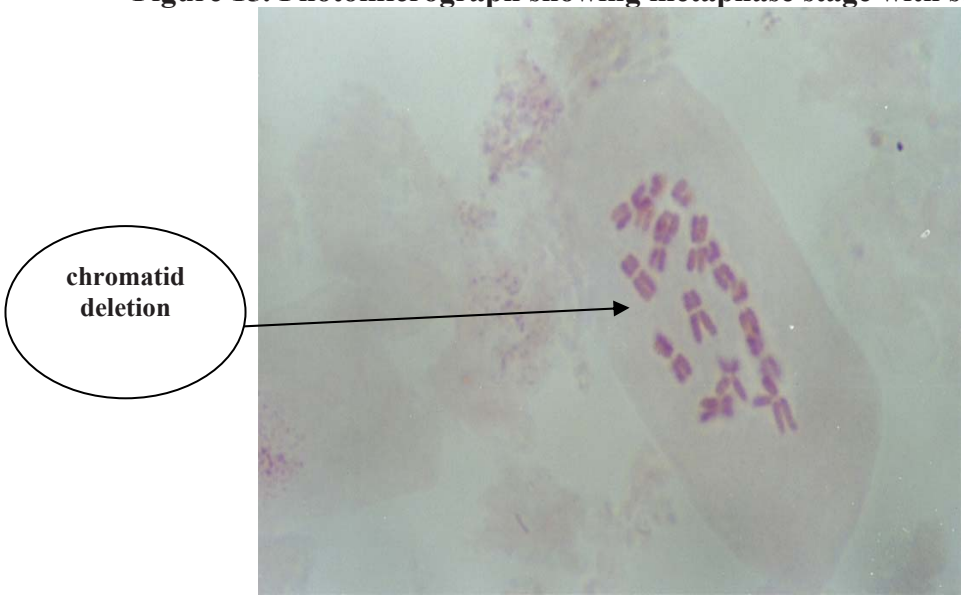

Figure 16. Photomicrograph showing metaphase stage with chromatid deletion.

These characters displayed highly significant differences between the different genotypes.

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الملخص العربي

تحديد بعض الصفات المورفولوجية والوراثية الخلوية لبعض الأصول الوراثية لنبات الشعير

محمد عبد العزيز محمد عامر

أجري هذا البحث بمزرعة كلية الزراعة ومعمل السمية الوراثية بالمساعدة المقدمة من الدكتور محمد عبد الباعث الصيحي خلال عام ٢٠١٤ وتم زراعة حبوب هذه الأصناف حتى وصلت النباتات الى النضج التام وتم توصيف سبع صفات على النبات وهي:١- طبيعة النمو. ٢- وجود شعيرات على غمد الأوراق السفلى. ٣- درجة تلون أذينات ورقة العلم بالأنثوسيانين. ٤- نسبة أوراق العلم الملتوية. ٥- وجود الشمع على ورقة العلم. ٦- وجود الشمع على عنق الساق. ٧- أغلفة الحبة. وتم توصيف الصفات السبعة سابقة الذكر على التراكيب الوراثية (الأصول الوراثية) لنبات الشعير كما هو موضح في الجدول رقم (١) وهي: ١- ٧٥٤٣ ٢- ٧٥٣٦ ٣- ٧٤٤٠ ٤-٧٤٤١ ٥- ٧٤٤٢ ٦- ٧٤٥٠ ٧- ٧٤٥٢ ٨- ٧٤٥٤ ٩- ٧٤٥٨ ١٠-٧٤٦٦ ١١- ٧٤٧١ ١٢- ٧٤٧٦ ١٣- ٧٤٧٩ ١٤- ٧٤٨٣ ١٥-٧٤٨٥ ١٦- ٧٤٨٩

وأوضحت الدراسة كما هو موضح في الجدول رقم (٢) وجود تباين واضح بين التراكيب الوراثية الستة عشرا إختلافا كبيرا في كل الصفات تحت الدراسة. ماعدا صفة أغلفة الحبة الموجودة في كل التراكي الوراثية الستة عشر.

وكذلك تم الحصول على خلايا القمة الناميـة للجذور والمعاملة بالكولشسين لمعرفة أعداد الكروموسومات لدراسة الانقسام الميتوزي هذا وقد أظهرت النتائج المتحصل عليها اختلافات معنوية في الصفات المدروسة وأوضحت الفحوص الميكروسكوبية انها جميعها تحتوي على عدد ١٤ كروموسوم وأوصت الدراسة بتوظيف هذه البيانات في برامج الانتخاب والتربية المستقبلية.