Asian J. Pharm. Res. Vol 1, Issue 2, 38-41, 2011.

ISSN 2231 – 363X
2231 – 3621

Asian Journal
of
PHARMACEUTICAL RESEARCH
Journal homepage: - www.ajprjournal.com

PHARMACOGNOSTIC CHARACTERIZATION OF *TRITICUM DURUM* (WHEAT SPECIES)

T.R. Desai[1], V.T. Desai[1], K.V. Shah[1*], P. R. Tirgar[1], D.B. Sheth[1], R.K. Goyal[2]

[1]R. K. College Of Pharmacy, Rajkot- Bhavnagar Highway, Kasturbadham, Rajkot, Gujarat, India-360 020.
[2]L. M. College of Pharmacy, Navrangpura, Ahmedabad, Gujarat, India- 380 009.

ABSTRACT

Wheat, (*Triticum* species) a cereal grass of the Gramineae (poaceae) family, is the world's largest edible grain cereal-grass crop. It has been a food crop for mankind since the beginning of agriculture. Wheat grass has been traditionally used to treat various diseases and disorders, since ancient times. Although over 30,000 varieties of wheat exist, three major varieties (species) of wheat, which are used throughout the world, include *Triticum aestivum*, *Triticum durum* and *Triticum dicoccum*. We have carried out a pharmacognostical characterization of *Triticum durum*. It is one of the most ancient of cultivated cereals. To our knowledge, a detailed Pharmacognostic study of this species of wheatgrass has not been reported earlier.

Keywords: *Triticum durum*, Pharmacognostic study, Microscopy, Wheat grass.

INTRODUCTION

Wheat has been a food crop for mankind since the beginning of agriculture. The wheat plant is an annual grass. Since ancient times, wheatgrass has been traditionally used to treat various diseases and disorders. There are several claims that wheatgrass is a safe and effective treatment for ailments such as high blood pressure, some cancers, obesity, diabetes, gastritis, ulcers, anemia, asthma and eczema [1]. It is mainly grown as a winter annual in milder climates, with seeding in the fall and harvest from June through August depending on the length of the winter. In areas with rigorous winter climates it is mainly spring seeded. Planting is as early as soil can be worked, and harvest is in late summer and early fall. In early growth stages the wheat plant consists of a much-compressed stem or crown and numerous narrowly linear or linear-lanceolate leaves [2]. For over fifty years, researchers have known that the cereal plant, at this young green stage, is many times richer in the levels of vitamins, minerals and proteins as compared to seed kernel, or grain products of the mature cereal plant [3]. The young germinated plant is a factory of enzyme and growth activity. In the early stages of growth they store large amounts of vitamins and proteins in the young blades. After jointing stage, the nutritional level in the leaves drops rapidly while the fiber content increases rapidly. The jointing stage is that point at which the inter nodal tissue in the grass leaf begins to elongate, forming a stem. This stage represents the peak of the cereal plant's vegetative development [4].

Although over 30,000 varieties of wheat exist, they are of two major types: bread wheat and durum wheat. Agriculturally, important species of *Triticum* include - (l) *Triticum aestivum* (Common wheat, bread wheat, local varieties–Lok 1, GW273) – *Triticum aestivum* comprises nearly 95 percent of the wheat grown. Its principal use is for flour. It is the most important variety for agriculture. (II) *Triticum durum* (Durum wheat, local variety Raj 1555) - *Triticum durum* is used mainly for the manufacture of semolina, which is made into macaroni, spaghetti and related products. It is next in importance to *Triticum aestivum*. (III) *Triticum dicoccum* (Emmer wheat, local variety DDK) – *Triticum dicoccum* is one of the most ancient of cultivated cereals [2].

Corresponding Author:- **K.V. Shah** E-mail: arihant_ketan@rediffmail.com

Asian J. Pharm. Res. Vol 1, Issue 2, 38-41, 2011.

ISSN 2231 – 363X
2231 – 3621

It is known that one of the major problems encountered in crude plant drugs is the batch-to-batch variation in their efficacies. Such variations could arise due to natural genetic variation, seasonal variation, species variation, differences in the soil or climatic conditions and nutritional status etc. of the medicinal plants.

However, no authentic Pharmacognostic properties have been reported on commonly used varieties of wheat to grow wheatgrass. Hence, in an attempt to facilitate systematic approach towards development of wheat grass as a standardized herbal medicine and to update the literature in this area, we carried out pharmacognostic characterization of *Triticum durum*.

MATERIALS AND METHODS

Identification of wheat variety

Certified Sample of *Triticum durum* was acquired from Wheat Research Center, Gujarat Krushi University, Junagadh, Gujarat. The authenticity of this certified sample was alsoconfirmed by comparing their morphological characters with the description mentioned in different standard texts and floras [2]. Voucher specimen was deposited at B. K. Mody Government Pharmacy College, Rajkot, Gujarat.

Procedure for growing wheatgrass

This wheat variety was grown as per the standard procedure described below [1].

1) Adequate quantity of unpolished wheat grain was soaked overnight in water in a container. 2) On the next day, the soaked wheat-grain were spread on the surface of the soil filled in plastic trays. Care was taken so that the grains did not touch one another. 3) A thin layer of soil was sprinkled on the wheat grains. 4) The tray was covered with a newspaper to provide darkness, which helps the sprouting. 5) The tray was kept in a covered balcony. 6) Next day the tray was uncovered to spray on some water and was covered again with the newspaper. 7) Step 6 was repeated every day until sprouting took place, after which the tray was left uncovered and watered everyday for 8 days. 8) On 9^{th} day, the wheatgrass was harvested by cutting it with a clean pair of scissors about 1/2" above the surface of the soil.

Microscopic studies

To characterize and differentiate among the three varieties of wheatgrass, this variety was subjected to microscopic study, which included transverse section, surface preparation and powder study. For powder study the grass was cleaned and dried in a dark place for four days. It was powdered, passed through 40# sieve and stored in airtight bottles.

RESULTS

Macroscopical features

In conformation with the description in literature; the leaves were near glabrous, auriculate, with blades narrow to broadly linear, 2–20 mm wide, flat and without cross venation [2]. The leaf blade was linear and parallel–veined with mid rib projecting on the back, continuing someway along the sheath.

Microscopical studies

Microscopic studies of transverse sections, surface preparations and powder studies of *Triticum durum* was conducted using high-resolution microscope. The structure of wheatgrass leaf showed elaborate epidermis with characteristic stomata and trichomes, green assimilating parenchyma, conducting vascular bundles and longitudinal strands of fibrous stereome or supporting tissue.

Surface preparations of different species of Triticum

As shown in the epidermis of the blade of the leaf was found to be composed of a number of diverse elements arranged in parallel rows along the long axis. Some of the individual rows consisted entirely of elongated cells placed end to end, each cell, with convex cutinised outer wall 4-5 μ thick, appearing in longitudinal section as a narrow rectangle 150-300μ long and 15-20 μ wide. To the right and left of the central line were rows of long cells interspersed with hairs. Parallel to these, at the base of the ridge, there were single or double lines of stomata. In the furrow between two ridges was a band of three to seven rows of elongated cells, whose walls were thinner and not so distinctly parallel to each other are bulliform cells or motor cells.

Transverse section of Triticum durum leaf (General description)

On the upper surface of the leaf there was a series of longitudinal ridges or ribs, the lower surface being almost flat. The epidermal cells covering the ridges differed in form and arrangement from those over the furrows and along the edge of the leaf.

Running along the summit of each ridge there was a single row of elongated thick-walled and pitted cells alternating with hairs. On the flank of the ridge, right and left of the central line, there were three to five rows of long cells interspersed with short one and hairs. Parallel to these, at the base of the ridge, were single or double lines of stomata. In the furrow between two ridges there was a band of three to seven rows of elongated cells, whose walls were thinner. They were not distinctly parallel to each other are bulliform cells or motor cells. The trichomes or hairs were always unicellular, and varied in length and stoutness.

Some of them were blunt on the edges of older leaves where as others were short and stout, 20-30 m long, with fine curved points rendering the surface scabrid.

Asian J. Pharm. Res. Vol 1, Issue 2, 38-41, 2011.

ISSN 2231 – 363X
2231 – 3621

On the leaves of *T.aestivum*, ample numbers of hairs were present, while in *T. dicoccum* and *T. durum* they were sparsely distributed on the surface of the leaf.

These were usually more on the upper epidermis than the lower epidermis. Each stoma on the leaf consisted of four cells, the two guard cells being narrow, with specially thickened walls round the stomatal pore and thin-walled widely dilated ends: the pore when closed appears as a narrow slit 30-40 m long. The ratio of the number of stomata on the upper and lower epidermis respectively was about 10:7. In the transverse section the pores of the stomata were seen to be in communication with large intracellular cavities in the mesophyll, called lacunae. The parenchyma of the leaf consists chiefly of thin-walled assimilating tissue, containing lenticular chloroplasts 4.5-6μ in diameter. The cells of the chlorophyll-containing tissue in the central part of the leaf were much more irregular in shape and are loosely packed, with large intracellular spaces between them. Chloroplasts were present especially in the sub-epidermal layers. In each cell on the outside of stereome, and between the vascular bundles, there was a single crystal or cluster of crystals of calciumoxalate. Vascular bundles were somewhat nearer to the lower surface than the upper surface of the leaf. All vascular bundles were collateral, with the xylem towards the upper surface of the leaf and the phloem bellow. In the xylem there were one or two vessels 20μ in diameter with annular or spiral thickening with narrow elliptical pits. Each bundle was surrounded by an inner and outer sheath; the former enclosed the vascular strand, and was composed of elongated thick-walled cells; the outer or 'parenchyma sheath' was more conspicuous and consisted of thin-walled cells, almost circular in transverse section. Above and below the bundles, and arranged parallel with them along the leaf were strands of stereome or supporting tissue consisting of sclerenchymatous fibers.

Transverse section of T.durum leaf

Trichomes were almost absent or very rare but stomata were more in number than other varieties. Lower epidermal cells had more motor cells in comparison to upper one. Lower portion of median vein was more bulging than other species. Xylem vessels were more in number than in other species. Outer sheath of vascular bundles were incomplete.

Powder characters of *Triticum durum*

Epidermal cells in surface view were elongated and rectangular having few numbers of stomata. Trichomes were simple, unicellular and uniseriate. Fibers were more in number and reticulated vessels were almost absent.

DISCUSSION

Medicinal plants play a key role in the human health care. About 75% of theworld population relies on the use of traditional medicine, which is predominantly based on plant materials. The traditional medicine by and large relies on practical experiences without significant references to modern scientific principles. A detailed investigation and documentation of plants used in local health traditions and pharmacological evaluation of these plants and their taxonomical relatives can lead to the development of invaluable plant drugs for many dreaded diseases. Traditionally, wheatgrass has been used as a medicinal herb in India. There are several claims that wheatgrass is a safe and effective treatment for ailments such as high blood pressure, some cancers, obesity, diabetes, gastritis, ulcers, anemia, asthma and eczema [1]. Further, some clinical trials have revealed that regular ingestion of wheatgrass is beneficial in chronic diseases like ulcerative colitis [5] and thalassemia [6].

Presently, there are a number of wheatgrass suppliers, in almost all cities of India, supplying fresh wheat grass daily to their regular customers who use it as a traditional remedy against various ailments and also as a health tonic. It has been observed that these suppliers grow wheatgrass from whatever variety of wheat is available to them from market. Further, herbal drugs are invariably single plant extracts or mixtures of extracts from different plants, which have been carefully standardized. One of the major problems encountered in crude plant drugs is the batch-to-batch variation in their efficacies. Such variations could arise due to natural genetic variation (Chemotypes), seasonal variation, species variation, differences in the soil and climatic conditions, nutritional status, etc. of the medicinal plants. Hence, in an attempt to facilitate systematic approach towards development of wheatgrass as a standardized phytomedicine/herbal medicine and to update the literature in this area, we conducted the study on pharmacognostic characteristics of three major species of wheat.

Microscopic studies of transverse sections, surface preparation and powder study of *Triticum durum* was conducted using high-resolution microscope. In conformation with the description in literature; the leaves were near glabrous, auriculate, with blades narrow to broadly linear, 2-20 mm wide, flat and without cross venation [2]. The leaf blade was linear and parallel-veined with mid rib projecting on the back, continuing someway along the sheath. Some outstanding differentiating characters in transverse section of *Triticum durum* leaf were: Trichomes were almost absent or very rare but stomata were more in number than other verities. Lower epidermal cells had more motor cells in comparison to upper one. Lower portion of median vein was more bulging than other species. Xylem vessels were more in number than in other species. Outer sheath of vascular bundles

Asian J. Pharm. Res. Vol 1, Issue 2, 38-41, 2011.

ISSN 2231 – 363X
2231 – 3621

were incomplete. Also, in powder study *Triticum durum* differed in trichomes only, which were simple, unicellular and uniseriate but were smaller in size than *T. aestivum*. Fibers were more in number and reticulated vessels were almost absent.

CONCLUSION

We conclude that though wheatgrass grown from this variety of wheat show many similar characters in confirmation with that described in literature.

ACKNOWLEDGEMENTS

Author acknowledges, Wheat Research Center, Gujarat Krushi University, Junagadh, Gujarat for providing certified variety of wheatgrass species.

REFERENCES

1. Wigmore A. The wheatgrass Book. Avery Publishing Group, Wayne, New Jersey, 1985.
2. Percival J. In: The wheat plant, Duckworth, UK, 1974, 55-59.
3. Schnabel C. The biologic value of high protein cereal grasses, Paper presented to the biologic section of the *Am.Chem. Soc*. in New York, 22, 1935.
4. Kohler G. The effect of stages of growth on the chemistry of the grasses. *J. Biol. Chem*., 152, 1944, 215-223.
5. Ben-Ayre E, GoldinE, Wengrower D, Stamper A, Kohn R, Berry E. Wheat grass juice in the treatment of active distal ulcerative colitis: a randomized double-blind placebo-controlled trial. *Scand. J. Gastroenterol*., 37, 2002, 444-449.
6. Marwaha R, Bansal D, Kaur S, Trehan A, Wheat grass juice reduces transfusion Requirement in patients with thalassemia major: A pilot study. *Indian Pediatrics*, 41, 2004, 716-720.