Allelopathy is a mechanism in which chemicals produced by weed plants may increase or decrease the associated plant growth. Molish (1937), coined the term "allelopathy" as an interaction among the plants and the micro-organisms.

Allelopathy is an interference mechanism, in which live or dead plant materials release chemicals substances, which inhibit or stimulate the associated plant growth (Harper, 1977; May & Ash, 1990). Allelopathy, may also play an eminent role in the intraspecific and interspecific competition and may determine the type of interspecific association. The plant may exhibit inhibitory or rarely stimulatory effects on germination and growth of other plants in the immediate vicinity.

1. Plants are known to release chemicals into the environment by several means which, depending upon edaphic and climatic factors, may influence the growth of neighbouring species.

2. This phenomenon could be exploited for the development of eco-friendly (nonchemical) weed management through the use of:

   (a) Allelopathic cover crops,

   (b) Allelochemicals as natural herbicides,

   (c) Allelopathic crops cultivars.

3. From olden days, certain cultivated crops or individual plants such as buckwheat, black mustard, sunflower, black walnut, cereal crops such as sorghum, wheat barley, oats and rye have been widely reported to suppress weed species.
A great deal of allelopathic research has been conducted in various fields of agricultural and biological sciences. Hence, International Allelopathy Society in 1996 broadened the definition of allelopathy to include any processes involving secondary metabolites produced by plants, micro-organisms, viruses and fungi that influence the growth and development of agricultural and biological systems. (Anon, 1996). In future, worldwide, there would be increasing demands for better quality and quantity of food due to rapid increase in human population. Therefore, for sustainability of agriculture, we need to minimize the use of present pesticides (such as weedicides, insecticides, nematicides, fungicides etc.), to control various pests, weeds, insects, nematodes, and fungal pathogens in field crops, through the use of allelopathic strategies for pest management (Grainge & Ahmed, 1988; Heisey, 1990). One of the most studied aspects of allelopathy has the role of allelopathy in agriculture. Current research is focused on the effects of weeds on crops and crops on weeds. This research sees the potential of allelochemicals as growth regulators and natural herbicides to promote sustainable agriculture.

A number of such allelochemicals are commercially available or in the process of large scale manufacture. The weed control is the basic requirement and the major component of management in the production system (Norris, 1982; Young et al., 1996). The control of weeds in agriculture is an immense problem. Weeds consume the soil nutrients, available moisture, and compete for space and sunlight with crop plants, thereby causing yield reduction of crops. In addition, weeds decrease the quality and quantity of farm produce and consequently reduce their market value (Hanif et al., 2004; Pervaiz & Quazi, 1999).
HISTORY:
Allelopathy is a new field of science, as the term Allelopathy is derived from two Greek words. ‘Allelon’ means each other and ‘Pathos’ means to suffer i.e., the injurious effects of one upon another. This term was first used in 1937 by the Austrian Professor Hans Molisch in the book "Der Einfluss einer Pflanze auf die andere- Allelopathie (The effect of plants on Each Other)" published in German. However, Molisch (1973) coined this term which refers to all biochemical interactions (stimulatory and inhibitory) among plants, including micro-organisms. It represents the plant against plant aspect of the broader field of chemical ecology.

Whittaker and Feeny 1971, published a study in the journal Science, which defined allelochemicals as all chemical interactions among organism. In 1984, Elroy Leon Rice in his monograph on allelopathy enlarged the definition to include all direct positive or negative effects of a plant on another plant or on micro-organisms by the liberation of biochemical into the natural environment.

Over the next ten years, the term was used by other researchers to describe broader chemical interactions between organisms and by 1996 the International Homeopathy Society defined allelopathy as Any process involving secondary metabolites produced by plants, algae, bacteria and fungi that influences the growth and development of agriculture and biological systems.

In more recent times, plant researchers have begun to switch back to the original definition of substances that are produced by one plant that inhibit another plant. Theophrastus, who lived around 300 BC noticed the inhibitory effects of pigweed on alfalfa. In China around the first century A.D, Yang and Tang described 267 Plants that had pesticidal abilities, including those with allelopathic effects. In 1832, the Swiss Botanist De Candolle suggested that crop plant exudates were responsible for an agriculture problem called soil sickness.
Description of weed (*Asphodelus tenuifolius* Cav.)

**A. tenuifolius** is an erect annual, monocotyledonous herb, root yellowish in young plants and dark brown at maturity, superficially has the appearance of the taproot system of dicotyledons. In fact the ridged and furrowed organ is a hard and compacted bundle of fibrous roots, which may sometimes twist to give a rope-like appearance, leaves numerous, all basal, hollow, slender, gradually acuminate to a point, 10 to 40 cm long, the base sheathing, smooth to minutely hairy

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<td><em>Asphodelus</em></td>
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<td>Species</td>
<td><em>A. tenuifolius</em></td>
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Seeming to rise as a 'bunch' from the soil, simple, sparse dichotomous branching in upper region, stout, 3 mm in diameter, up to 60 cm long. Flowers campanulate, white with pink or purple stripe, in lax racemes; bracteate, pedicellate, short pedicel may be jointed.

Petals 1.5 cm long in six perianth segments; stamens six; simple, superior, 3-carpelled, 3-loculed ovary. Flowering progressing upward in the inflorescence over a period of weeks, normally flowers do not open until late afternoon and unless conditions are dull and cool will close and wither before the next day. Fruit, a 3-valved globular capsule, dehiscing at partitions into the cavity, transversely wrinkled, about 3 mm long; seeds 3-angled, blackish, finely pebbled texture, deep irregular dents on face and back.

Onion weeds (*Asphodelus tenuifolius* Cavase): In English it is called Onion weeds/wild onion and locally known as Piazi and Basri. As a medicinal plant, it is used externally to cure ulcer and inflamed parts (yunani) and seed is used as diuretic. *Asphodelus tenuifolius* Cavase (Onion weed) is a native to the Mediterranean region, but it is widespread, extending from Mediterranean region east through the Arabian Peninsula to the Indian Subcontinent, also in Malaysia, Australia, Chile, New Zealand, Mexico and United States of America. (Nasir & Ali, 1980-1989). Wild onion (*Asphodelus tenuifolius* Cav.) is a notorious weed of sand soils of Indo-Pak sub-continent. It is annual in habit.

It has been observed as a serious weed of rabi crops including chickpea (*Cicer arietinum* L.), wheat (*Triticum aestivum* L.) and rapeseed and mustard (*Brassica* spp.) in sandy Districts of NWFP viz. Karak, Lakki Marwat and parts of Dera Ismail Khan. In the Punjab, it is worst competitor with rabi crops in Mianwali, Bhakkar, Jhang and Layyah. Farm surveys conducted
during 2003 *Asphodelus tenuifolius* as the top most weed of chickpea in Lakki Marwat and Karak (Hassan and Khan, 2005).

Wheat is planted later, by that time some of the weed had germinated which is uprooted at the time of planting. While due to thermo-sensitivity of seed during the earlier planting of chickpea seeds do not germinate due to higher temperatures prevailing at that time. Thus, in order to substantiate the hypothesis under laboratory conditions, the instant studies were undertaken to formulate the planting time of chickpea in light. Sahi and Bhan (1991) from India also reported the rapid germination of *Asphodelus* at 20°C. The range of temperature was reported as 10 to 35°C. However, the highest germination was at 15°C.
Description of Test Crops

(A) Sorghum *(Sorghum bicolor L.)*

*Sorghum bicolor* (L.) Moench (grain Sorghum) is one of the most extensively cultivated cereals in the world, after rice, wheat and maize and particularly in arid to semi arid regions. In Asia, Sorghum is restricted almost exclusively to two countries, China and India. It is also grown in Pakistan as a rain fed crop. Sorghum is also emerging as a feed stock for ethanol production.
Sorghum is a genus of numerous species of grasses, one of which is raised for grain and many of which are used as fodder plants, either cultivated or as part of pasture. The plants are cultivated in warmer climates worldwide. Species are native to tropical and subtropical regions of all continents in addition to the southwest Pacific and Australasia. One species, *Sorghum bicolor*, is an important world crop, used for food (as grain and in sorghum syrup or "sorghum molasses"), fodder, the production of alcoholic beverages, and biofuels. Most varieties are drought- and heat-tolerant and are especially important in arid regions, where the grain is one of the staples for poor and rural people. These varieties form important components of pastures in many tropical regions. *Sorghum bicolor* is an important food crop in Africa, Central America and South Asia and is the "fifth most important cereal crop grown in the world".

Some species of sorghum can contain levels of hydrogen cyanide, hordenine and nitrates lethal to grazing animals in the early stages of the plant's growth. When stressed by drought or heat, plants can also contain toxic levels of cyanide and/or nitrates at later stages in growth.
Uses:

Sorghum, like many grains, has a diversity of uses, including human consumption and animal feed.

**Human food**

Sorghum is used for human nutrition all over the world. Globally, over half of all sorghum is used for human consumption. It is a major crop for many poor farmers, especially in Africa, Central America and South Asia. Grain sorghum is used for flours, porridges and side dishes, malted and distilled beverages, and specially foods such as popped grain.

**Feed**

Sorghum is also considered to be a significant crop for animal feeds and in the US this is the major use of the grain. Finely ground grains or high-tannin grains are less palatable to cattle. Due to its hard and waxy covering, the grains need to be processed by cracking, rolling, or grinding. When processed the nutritional value of sorghum is comparable (but not equal) to maize (corn), so it requires supplementation of vitamin A.

Grain sorghum is also used for silage but it is not as commonly used as the sweet sorghum for this purpose. Sweet sorghums have higher silage yield, but grain sorghums have higher nutrition due to the grains, therefore sweet sorghum farmers may plant soybeans along with sorghum to raise the nutritional value of the silage.

Pasture - Cattle and sheep are frequently pastured on grain silage after harvest but secondary growth produces prussic acid and may poison the animals, especially horses.
Other

Sorghum fibers are used in wallboard, fences, biodegradable packaging materials and solvents. Dried stalks are used for cooking fuel, and dye can be extracted from the plant to color leather.
A more recent use of sorghum is for ethanol By-products from ethanol production, such as sorghum-DDGS (distillers dried grains with solubles), are also finding a place in the market.
Maize, commonly referred to as corn in the United States, has been considered a unique plant since the time that the indigenous peoples of the Americas developed it to be their staple food. It is central to many sacred mythologies and creation stories which are still honored today. Maize was introduced from the New World to the Old World in the 1400's, and it was planted between the harvesting of spring and winter crops, filling an important niche as a summer crop. Today, the United States, China, the European Union, Brazil and Mexico are the world's largest producers of maize. Together, the US and China produce approximately 60% of the world maize crop. Maize accounts for 15-20% of the total daily calories in the diets of more than 20 developing countries, located mainly in Latin America and Africa. 68% of the land devoted to maize is located in the developing world, however only 46% of maize production occurs there, indicating the need for improving yields in developing countries where it is a major source of direct human consumption for many of the poor.
**Uses:**

**Chemicals:**

Starch from maize can also be used into plastics, fabrics, adhesives and many other chemical products. The corn steep liquor, a plentiful watery byproduct of maize wet milling process, is widely used in the biochemical industry and research as a culture medium to grow many kinds of microorganisms.

**Bio-fuel:**

"Feed maize" is being used increasingly for heating specialized corn stoves (similar to wood stoves) are available and use either feed maize or wood pellets to generate heat. Maize cobs are also used as a biomass fuel source. Maize is relatively cheap and home-heating furnaces have been developed which use maize kernels as a fuel. They feature a large hopper that feeds the uniformly sized maize kernels (or wood pellets or cherry pits) into the fire.

Maize is increasingly used as a feedstock for the production of ethanol fuel. Ethanol is mixed with gasoline to decrease the amount of pollutants emitted when used to fuel motor vehicles.

**Ornamental and other uses:**

Some forms of the plant are occasionally grown for ornamental use in the garden. For this purpose, variegated and colored leaf forms as well as those with colorful ears are used. Corncobs can be hollowed out and treated to make inexpensive smoking pipes

**Fodder:**

Maize makes a greater quantity of epigeous mass than other cereal plants so it can be used for fodder. Digestibility and palatability are higher when ensiled and fermented, rather than dried.
SIGNIFICANCE:

Allelopathy offers scope to reduce the effects of modern agriculture (environmental pollution, contamination of water resources, human/animal health hazards, toxic residues in food chain and development of pesticides resistant/tolerant species of pest) on agro ecosystems, using allelopathic strategies, hence, it provides basis to sustainable agriculture.

(1) Safe food production-
The yield produced by allelopathy is safe and have no danger for health. It is a natural phenomenon as allelochemicals are released from the plants. But on the other hand, the toxic residues of herbicides from plants or soil get enter into food chain and causes different diseases not only in humans but also in animals.

(2) Environmental protection-
Allelopathy is an important environment friendly science because it residues the reliance upon synthetic dangerous herbicides as allelochemicals in the allelopathic plants are natural. Hence allelopathy protects the environment.

(3) Resources Conservation
Synthetic herbicides are much expensive one. They increase the cost of production. Being the natural phenomenon, allelopathy is the cheapest method and hence conserves the resources.

(4) Sustainable Weed Management-
Various experiments have been successfully performed on allelopathy that demonstrate that if different crop water extracts can be tank mixed with one third dose of herbicides, gives nearly the same results as full dose of herbicides.
Allelochemical compounds from plants and microorganisms represent a wide range of potential in the design and development of new herbicide. Photosynthesis is potentially useful in agriculture as herbicides.

(5) Growth regulation

(6) Providing basic structures or templates for developing new synthetic herbicides
OBJECTIVES

(1) To study the allelopathic response of *Asphodelus tenuifolius* Cav. on germination and growth behavior of sorghum (*Sorghum bicolor* L.) in Dayalbagh (*In vitro*).

(2) To study the allelopathic response of *Asphodelus tenuifolius* Cav. on germination and growth behavior of sorghum (*Sorghum bicolor* L.) in Dayalbagh (*In vivo*).

(3) To study the allelopathic response of *Asphodelus tenuifolius* Cav. on germination and growth behavior of Maize (*Zea mays* L.) (*In vitro*).

(4) To study the allelopathic response of *Asphodelus tenuifolius* Cav. on germination and growth behavior of Maize (*Zea mays* L.) (*In vivo*).