*Int. J. Biol. Res*., 3(1): 31-34, 2015.

# EFFECTS OF WOKOZIM ORGANIC FERTILIZERS ON GERMINATION OF GUAR SEEDS

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**ABSTRACT**

Guar (*Cyamopsis tetragonoloba* (L.) Taub. is a leguminous plant of wide economic applications. Seeds of guar are the main source of guar gum. The present studies were conducted to investigate the seed germination of this species under various concentrations (0, 0.2%, 0.4%, 0.6, 0.8 and 1%) of three Wokozim fertilizers [F1 (Wokozim power plus, Batch # B140306), F2 (Wokozim power plus, Batch # B130325) and F3 (Wokozim Cotton, Batch # S121783, liquid). Distilled water was used as control. *Cent per cent* germination was observed at 0.6 to 1% concentration of (Wokozim granules, F2) treatments. Wokozim cotton liquid was found to be toxic and it caused significant decrease in germination percentage, germination rate, germination velocity and germination index at 0.8% and 1.0% concentrations. The mean germination time increased due to delayed seed germination in Wokozim liquid fertilizer.

**KEYWORDS:** Guar [*Cyamopsis tetragonoloba* (L.) Taub.], Wokozim fertilizers, Seed germination.

## NTRODUCTION

In the recent days, a surge has been observed in the demand of fresh vegetables as a staple food item. The landmark achievement of plant physiology and agriculture, during the nineteenth century, was the finding that soil fertility and crop yields could be enhanced by application of different nutrients to the soil. Nevertheless, micronutrients are required in very small quantities for crop plants, their deficiencies are known to hinder the elementary biochemical and physiological processes, resulting in significant reduction in productivity (Salisbury and Ross, 1992). Chemical fertilizers are quite often used to enhance production of vegetables which are accompanied with hazardous effects on human and soil health. Biological fertilizers, in recent years, have been demonstrated to enhance yield in different vegetables through mobilization of important nutritional elements from non-usable to usable forms by various biological processes (Kumar *et al*., 2001). Bio-fertilizers are known to maintain long term soil fertility and sustainability while enhancing the yield of crops by 10-30% (Khandelwal *et al*., 2012). Organic fertilizers are also reported to have a widespread role in soil fertility and crop production. During recent years, a continuous decrease in soil organic materials and micronutrients is observed due to factors like intensive cultivation and continuous use of chemical fertilizers. Prakash and co-workers reported that these conditions, if not reversed, could result in loss of biological diversity, agro-ecosystem disorders and destruction of soil structure (Prakash *et al*, 2003). It is established that humic substances (HS) enhances growth of root, leaf and shoot and stimulate the germination of various crop species (Piccolo *et al*., 1993). According to Kloepper and Schroth (1978), bio-fertilizers and manures enhance the activity of micro organisms in the soil and their by-products promote plant health and nutrition. Hormones, growth substances, solubility of potassium and phosphorus; along with other benefits of bio-fertilizers are the factors contributing to enhanced plant growth, development, and seed production (Sturz and Christie, 2003). Bio-fertilizers improve the rate of nutrient release from the soil. During mineralization process, some chelating agents are produced which facilitate the uptake of iron and other micro-nutrients (Schlecht *et al.*, 2006). It is a well-known fact that the rational use of fertilizer can enhance yield of crops (Sharma *et al*., 1996). Necessary factors like enzymes, cytokinins, auxins, betaines, hydrolysed proteins, and primary and secondary nutrients; are provided by organic fertilizers at all crucial stages, specially play a vital role in seed germination. Application of synthetic growth regulators could prolong flower and plant life, increase or retard plant height, abort flowers, prolong or break dormancy, promote rooting, branching and/or flowering (Malladi and Burns, 2007).

Wokozim fertilizers are type of organic fertilizers derived from Seaweed *(Ascophyllum nodosum*). Wokozim consist of Seaweed powder as a mixture of animal and plant origin; products go through fermentation process with the help of lactobacilli to produce free natural nutrients, the seaweed after fermentation releases enormous energy in the form of soluble nutrients which are readily available to the plant. Wokozim is eco-friendly, non-toxic, and has non-chemical origin. It contains elements which help in cell growth and breakdown of complex molecules into simpler ones which can be easily utilized by the plant. It also helps in improving plants natural self-defence system, which results in healthier crop with low pest pressure. It is organic source of natural substances that enhance plant's physiology at very low concentrations. Plants may thus be benefited from naturally occurring nutrients and growth stimulators in balanced proportion during the various critical phases i.e., Germination, vegetative growth, frame and biomass development, reproductive growth and maturity, differentiation and development to promote seed germination, carbon: nitrogen ratio differentiation. Reportedly, Wokozim helps in up taking of complex molecule from soil, increase early germination and enhance the photosynthetic activity. It stimulates the natural physiological system of the plant by providing essential nutritional elements in all stages of plant growth specially in seed germination (www.jaffer.BusinessUnit/JAS_Agro_Wokozim.aspx).

Guar, used as a vegetable and fodder, is a drought tolerant bushy leguminous crop which is well adapted to arid and semi-arid regions particularly on sandy soils (Undersander *et al*., 2006). The presence of Galactomannan (guar gum) in guar seeds makes it a valuable crop for several industries. e.g. textile, hydraulic fracking, oil and gas well drilling, paint, mining and construction, fire fighting, leather, explosive, pharmaceutical, paper, cosmetic, confectionary, beverages, dairy products, photography etc. The present investigation was aimed to investigate germination of guar under the influence of three Wokozim fertilizers as the good germination behaviour should play its role for better yield of a crop.

## MATERIALS AND METHODS

Wokozim fertilizers - F1 (Wokozim power plus, Batch # B140306), F2 (Wokozim power plus, B # B130325) & F3 (Wokozim Cotton, B # S121783, liquid) were used to test germination of guar. Each fertilizer had five treatments @ 0.2%, 0.4%, 0.6%, 0.8% & 1.0%, while treatment with distilled water was considered as control. The seeds of guar (*Cyamopsis tetragonoloba* (L.) Taub), were surface sterilized by using 1% bleach (NaOCl) for one minute, and rinse with sterilized distilled water. Ten seeds were placed in each 9cm diameter autoclaved glass Petri plate containing a blotter paper. Different concentrations of treatments of fertilizers (5mL) were poured in each plate after seed placement while distilled water was poured in control plates. There were three replicate to each treatment. Seed germination was recorded every 24 hours (AOSA. 1990) till seeds were fully germinated. Different parameters of germination were calculated according to following formulae:

1. Germination percentage (GP %) = (number of germinated seeds/total number of seeds) x 100 (till 3 days).
2. Germination Rate (GR) = Number of germinated seeds/ day (till last day of experiment (3 days).
3. Coefficient of velocity (CVG) was Calculated according to Maguire (1962) formula:

$$CVG = \frac{(G1 + G2 + G3 \ldots + Gn)}{(1 \times G1 + 2 \times G2 + \ldots nx\ Gn)}$$

where, G is the number of germinated seeds per day and n is the last day of germination (3rd day).

4. Means germination time (MGT) is calculated according to Ellis and Roberts (1981) as $MGT = \Sigma (nd) / \Sigma n$.

where 'n' is the number of germinated seeds on day d, and $\Sigma n$ is the total germinated seeds during experimental period.

5. Germination index (GI) = $\Sigma$ (Gt / Dt), summation of mean number of germinated seeds per day for t days (AOSA, 1983). Where Gt is the number of germinated seed on day t, and Dt is the total number of days (3days in this experiment).

## RESULTS AND DISCUSSION

**Germination percentage:** In Fig. 1 two fertilizers F1 and F2 showed increased in germination percentage with increasing the concentration. In accordance with Nezarat and Gholami (2009) and Gholami *et al.* (2009), Bio fertilizer enhanced the germination in comparison to the control on all measuring days, but significant differences were observed among the treatments only on the 2nd and 3rd days.

Nelson and Van Staden (1984) reported the beneficial effect of sea weed liquid fertilizer on terrestrial plants include improving the overall growth, yield and the ability to with stand adverse conditions. While in F3 germination percentage decreased gradually with respect to increasing the concentration. Cent per cent (100%) germination was observed only in F2 (0.2, 0.6 to 1%) while in F3 minimum germination percentage (10%) were recorded at 0.8 %. The most noticeable effect of Wokozim liquid fertilizer of given concentration was the inhibition the seed germination.

**Germination rate:** Seaweed extract has been also tested on seeds of beet (*Beta vulgaris*) (Wilcze and Ng, 1982). They observed that treated seed had better germination rates than the control. In the present experiment germination rate decreased with respect to time in F2 and F1 fertilizer while increasing the concentration. Maximum germination rate observed on day 1st at 0.2% i.e. (7.33) in F1 and 1% (7.33) in F2. Beside this in F3 maximum germination rate calculated in day 2nd at 0.4% but at day 3rd at this concentration germination rate unchanged, and at 0.6% on day 3rd maximum germination rate recorded i.e. (2.88) while at 0.8 and 1 % delaying and decreasing germination rate at day 2nd followed by day 3rd in F3 fertilizer (Fig. 1).

**Coefficient of germination velocity:** Maximum germination velocity (GV) was observed at 0.4% to 1% (0.82) in F1, whereas in F2 GV showed stability with respect to concentration. In F3 treatment germination velocity decreased gradually with increasing the concentration and minimum germination velocity was observed at 1% (Fig. 1).

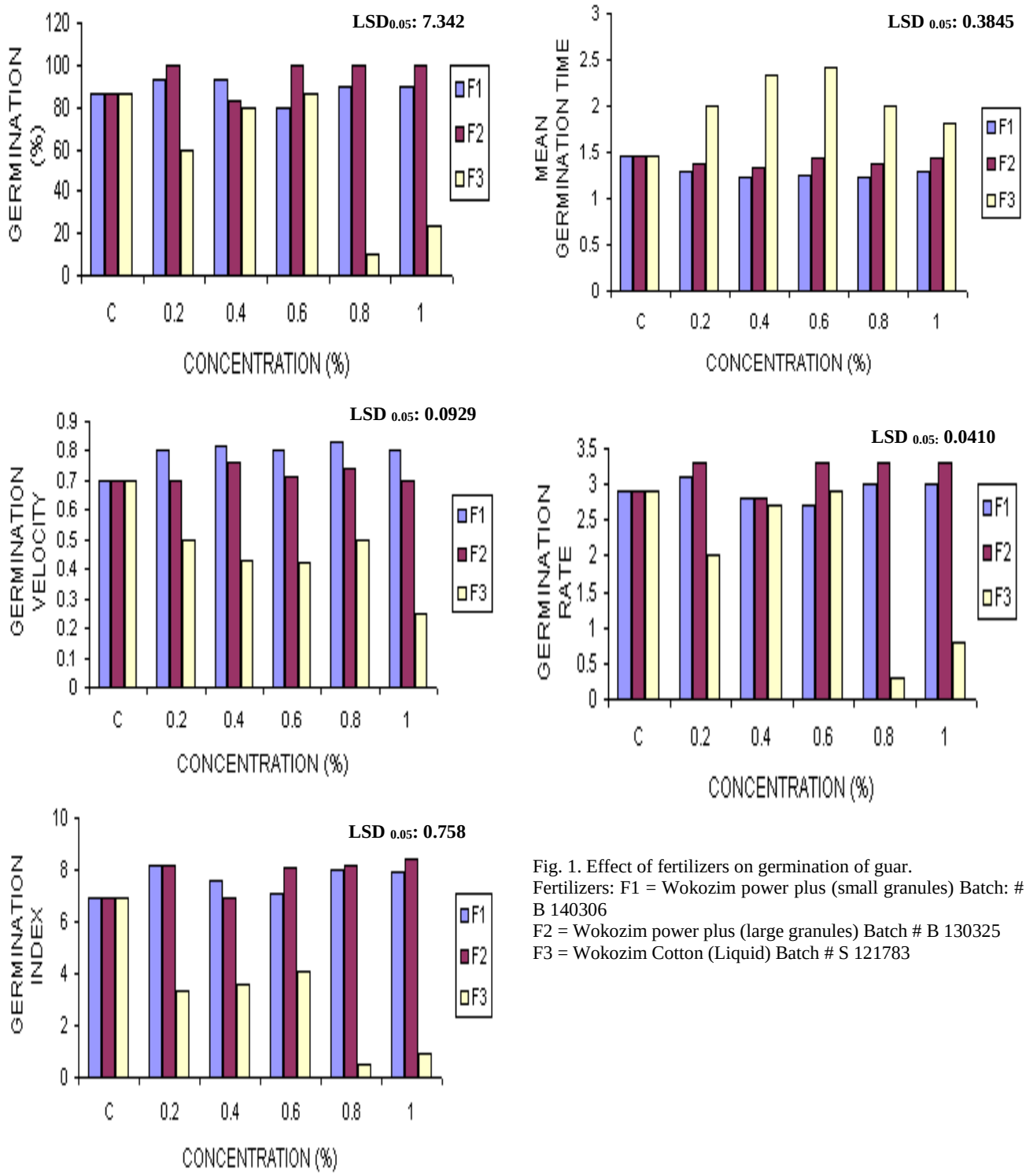


Fig. 1. Effect of fertilizers on germination of guar.
Fertilizers: F1 = Wokozim power plus (small granules) Batch: # B 140306
F2 = Wokozim power plus (large granules) Batch # B 130325
F3 = Wokozim Cotton (Liquid) Batch # S 121783

**Mean germination time:** The co-efficient of variation of germination time (CV) reported by Ranal and Santana, (2006), who measured the germination uniformity or in relation to the mean germination time, showed highest value under vermicompost application which may be because of its capacity to hold water and presence of growth-Activator substances (Arancon *et al*., 2004).

Delaying in seed germination in F3 treatment increased the mean germination time, i.e., the highest mean germination time at 0.4 and 0.6% was 2.33 and 2.40 days. In F1 and F2 the increase in fertilizer concentration caused the mean germination time to decrease as compared to control. The mean germination time decreased in F1 at higher concentration of the fertilizer. Fertilizer F2 behaved similar to F1 (Fig. 1).

**Germination index:** The present study showed significant increase in germination index of Guar plant in F1 and F2 treatment, while in F3 treatment showed significantly decrease in germination index due to delaying the seed germination with increasing the concentration, except at 0.6% (4.11) index (Fig. 1).

Organic fertilizers were reported to enhance the productivity of canola seeds by 21.7% (Yasari and Patwardhaml, 2007). Early emergence of seedlings and establishment was observed in peanut, with application of bio-fertilizers (Turner and Backman, 1989)**.** The use of organic manures and bio-fertilizers enhanced the yield of sesame seed (Weiss, 2000) and yield of maize (Gholami *et al*., 2009). In the present study Wokozim fertilizers showed variable effects on guar seed. *Cent per cent* germination was observed at 0.6 to 1% concentration of (Wokozim granules, F2) treatments. Wokozim liquid was found to be toxic and it caused significant decrease in germination percentage, germination rate, germination velocity and germination index at 0.8% and 1.0% concentrations. There is need to test Wokozim fertilizers for growth and yield response of other crops.

**Acknowledgements**

We are thankful to M/S Jaffer Agro Services, Karachi to provide Wokozim fertilizer samples. We gratefully acknowledged to Prof. Dr. M. Javed Zaki for providing laboratory facilities and to Prof. Dr. D. Khan for his help in preparation of this manuscript.

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(Received May 2015; Accepted June 2015)