

Research Article

HORMONAL SEED PRIMING WITH GA AND KINETIN INFLUENCES SEED AND OIL YIELDS IN TWO SESAME (*SESAMUM INDICUM*) CULTIVARS

Reza Farhadi Atalou¹, *Bahram Mirshekari², Mohammad Naghi Safar Zadeh Vishkaei¹

¹Department of Agronomy and Plant Breeding, College of Agriculture, Rasht Branch, Islamic Azad University, Rasht, Iran

²Department of Agronomy and Plant Breeding, College of Agriculture, Tabriz Branch, Islamic Azad University, Tabriz, Iran

*Author for Correspondence

ABSTRACT

Several different priming methods have been reported to be used commercially. In order to study effect of hormonal seed priming with GA and kinetin on seed and oil yields in two sesame (*Sesamum indicum*) cultivars as Ultan (M₁₁) and Yekta (Karaj₂₉), laboratory, greenhouse and field experiments were conducted during 2013 at the Agricultural Research Station of Islamic Azad University of Tabriz. Iran with three replications. The seed priming tests of sesame (*Sesamum indicum*) were performed in a completely randomized design, using solutions of GA and Kinetin at five concentrations of 0, 50, 100, 150 and 200 ppm. There is no significant difference between two sesame cultivars. The highest and positive effect of hormone priming on sesame root bulk obtained when its seeds treated with 50 ppm and 100 ppm of GA and kinetin. Seed yield of crop plant ranged from 1450 kg ha⁻¹ in 50 ppm GA up to 1001 kg ha⁻¹ in 200 ppm kinetin. When the sesame seeds primed with 50 ppm and 100 ppm GA, the crop produced higher oil yield of averaged 582 kg ha⁻¹, but only 414 kg ha⁻¹ from those seeds treated in 200 ppm GA and kinetin. Hormonal seed priming with GA and kinetin influences yield components in two sesame cultivars.

Keywords: Increasing Effect, Root Bulk, Sesame Cultivars, Yield Components

INTRODUCTION

Sesame (*Sesamum indicum*) is a flowering plant in the genus *Sesamum*. Numerous wild relatives occur in Africa and a smaller number in India. It is cultivated for its edible seeds, which grow in pods. It is an annual plant growing 50 to 100 cm tall with opposite leaves. The flowers are yellow, tubular, with a four-lobed mouth. Sesame fruit is a capsule, normally pubescent, rectangular in section and typically grooved with a short triangular beak (Langham, 2013).

Priming could be defined as controlling the hydration level within seeds so that the metabolic activity necessary for germination can occur. Several different priming methods have been reported to be used commercially (Donald, 2000). Farooq *et al.*, (2008) conducted a study to explore the possibility of yield improving in late sown wheat crop by seed priming.

There is little information about physical methods of seed treatment. In recent years, interest concerning the use of pre-treatment methods of seed priming due to their effects plant grow in has increased (Carbonell *et al.*, 2000; Dinoev, 2006; Hernandez *et al.*, 2010; Vasilevski, 2003). Therefore, the study aimed was to determine the effect of hormonal seed priming with GA and kinetin on seedling vigor and yield in two sesame (*Sesamum indicum*) cultivars.

MATERIALS AND METHODS

Laboratory, greenhouse and field experiments were conducted during 2013 on two sesame (*Sesamum indicum*) cultivars as Ultan (M₁₁) and Yekta (Karaj₂₉), separately, with three replications. Tabriz is located in the north-west of Iran and the climate is semiarid and cold; in spite of dispersed precipitation in summer, it's arid and average annual precipitation is 270 mm.

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Laboratory and Greenhouse Experiments

The seed priming tests of sesame (*Sesamum indicum*) were performed in a completely randomized design, using solutions of GA and Kinetin at five concentrations of 0, 50, 100, 150 and 200 ppm. There were three replications of each priming solution. Seeds were soaked in the required aqueous solutions of hormones. Twenty five primed seeds for each replicate were placed in germinator at 25 ± 1 °C for a germination test in a Petri dish containing Whatman filter paper No. 1 that had been thoroughly moistened with water and germination was checked once a day for 10 d. The recorded data were final germination percentage, seedling biomass and seedling vigor index.

Final germination percentage (GP) was calculated as the cumulative number of germinated seeds with normal radicles by using below equation, as described by Larsen and Andreasen (2004).

$$GP = \frac{\sum n}{N} \times 100$$

Where, n is number of germinated seeds at each counting and N is total seeds in each treatment.

Seedling vigor index (SVI) was calculated according to Abdul-Baki and Anderson (1973) by using below equation.

$$SVI = SDW \times GP$$

Where, GP, SDW and SVI are final germination percentage, seedling dry weight and seedling vigor index, respectively.

Field Study

The sesame seeds were sown on 6 May, 2013. All plots were hand removed for other weed species in growth season. Plots were irrigated immediately after sowing to assure uniform emergence.

The experimental design was a factorially randomized complete block with three replications. All data were analyzed using the MSTAT-C software. Treatment means were separated using Fischer's Protected LSD at $P < 0.05$.

RESULTS AND DISCUSSION

Analysis of Variance

Analysis of variance indicated that effect of studied treatments on root bulk, seed yield and oil yield was significant at 5%, and on the capsule number per plant and capsule length was significant at 1% probability levels. Other measured traits were not affected by priming treatments.

Mean Comparisons

The highest and positive effect of hormone priming on sesame root bulk obtained when its seeds treated with 50 ppm and 100 ppm of GA and kinetin. Whereas, with increasing of hormone concentrations this value restricted significantly (Figure 1). Germination rate as well as growth of crop plants can be improved by priming (Marks and Szczówka 2010; Podleony et al., 2004).

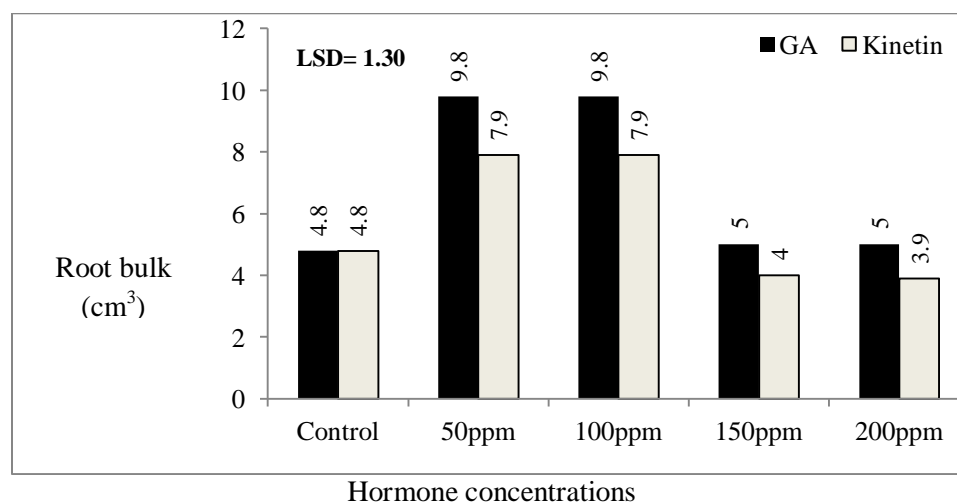


Figure 1: Interaction of hormone and its concentrations on sesame root bulk

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Capsule number per plant of sesame ranged from 22.5 capsule in 50 ppm GA up to 13.2 capsule in 150 ppm kinetin. Also, there is no significant difference among other treatments except 50 ppm GA (Figure 2). Dubey *et al.*, (2007) showed an increase in plant height and branches per plant when okra (*Abelmoschus esculentus* L. Monch.) seeds were primed.

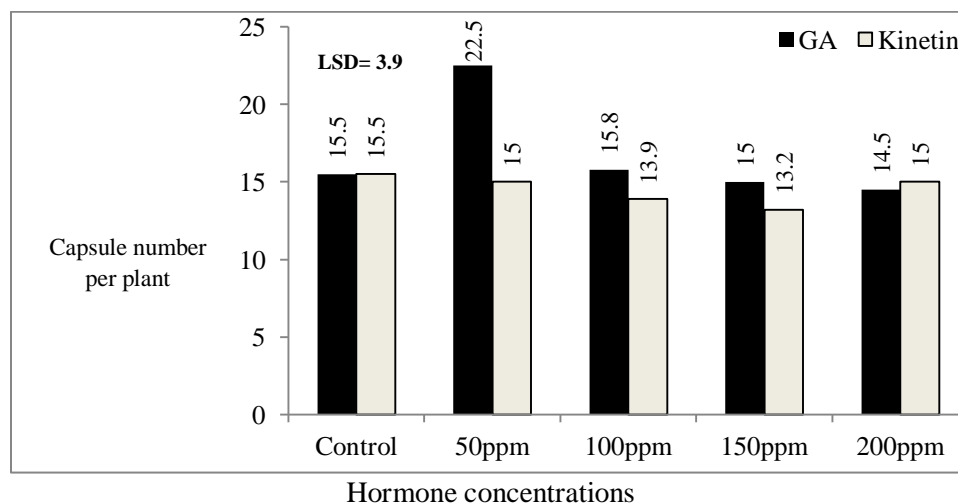


Figure 2: Interaction of hormone and its concentrations on capsule number per plant of sesame

When the sesame seeds primed with 50 ppm GA, the crop produced capsules with higher length of 6.6 cm, but only 5.1 cm from those seeds treated in 200 ppm kinetin (Figure 3). The vigor of seeds can be improved by techniques generally known as seed priming, which enhance the speed and uniformity of germination, and finally yield attributes (Demir and Venter, 1999).

There is no significant difference among treatments with a view to 1000 seed weight.

Seed yield of crop plant ranged from 1450 kg ha⁻¹ in 50 ppm GA up to 1001 kg ha⁻¹ in 200 ppm kinetin. Also, there is no significant difference among 150 ppm, 200 ppm concentrations (Figure 4). It is suggested that seed priming generally causes faster germination and field emergence, which have practical agronomic importance in crop production, especially under adverse environmental conditions (Donald, 2000). In an experiment conducted by Mirshekari (2014) wheat seeds primed before sowing with gibberlic acid and kinetin could be recommended due to faster growth.

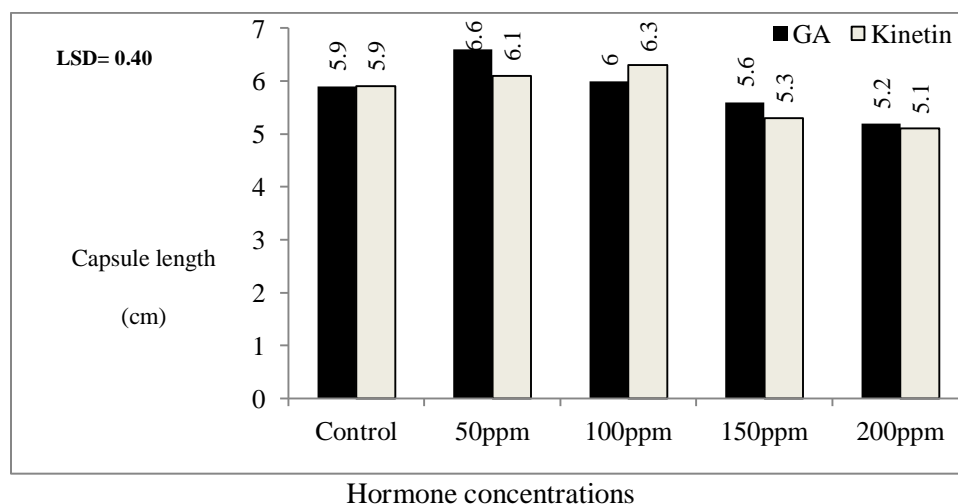


Figure 3: Interaction of hormone and its concentrations on sesame capsule length

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When the sesame seeds primed with 50 ppm and 100 ppm GA, the crop produced higher oil yield of averaged 582 kg ha⁻¹, but only 414 kg ha⁻¹ from those seeds treated in 200 ppm GA and kinetin. Oil yield in non primed seeds was greater than higher concentrations of both GA and kinetin hormones (Figure 5).

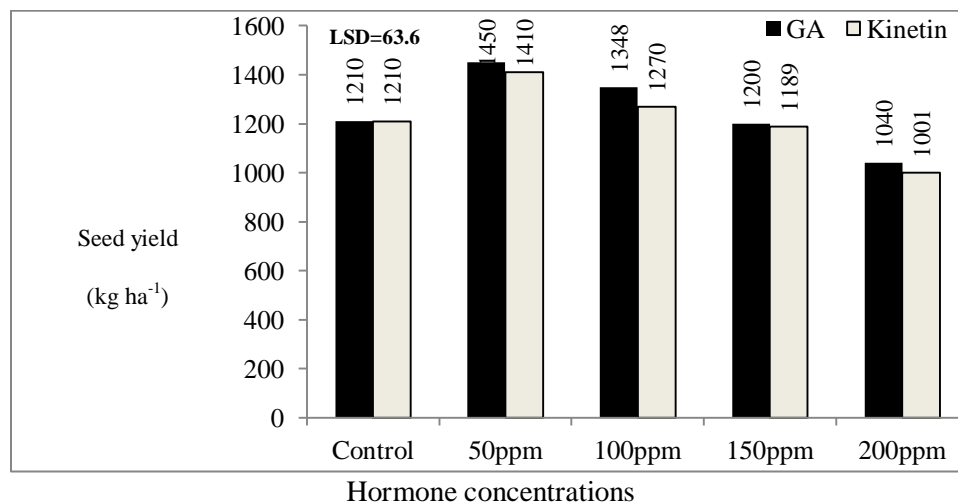


Figure 4: Interaction of hormone and its concentrations on sesame seed yield

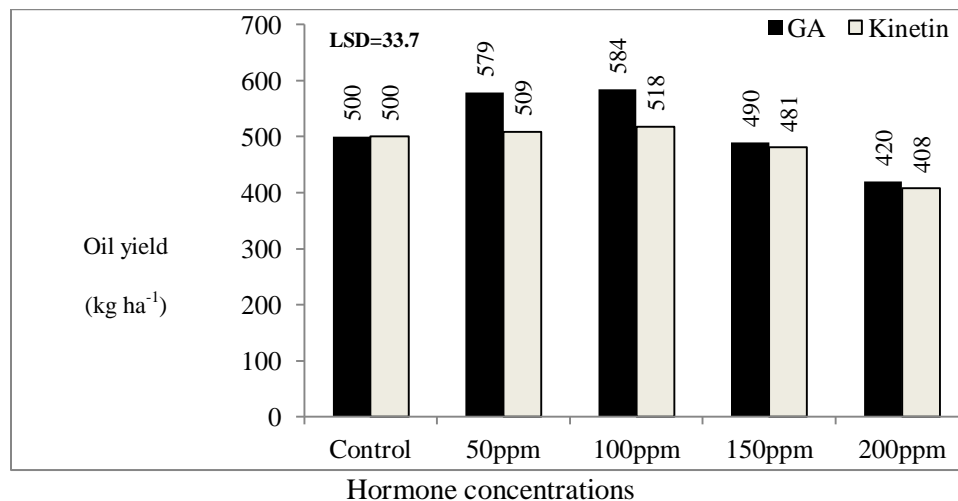


Figure 5: Interaction of hormone and its concentrations on sesame oil yield

Conclusion

Hormonal seed priming with GA and kinetin influences yield components in two sesame cultivars.

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