EFFECTS OF DICAMBA CONCENTRATION ON THE EMBRYO CULTURES OF SOME BREAD WHEAT (*TRITICUM AESTIVUM* L.) GENOTYPES

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ABSTRACT

The objective of this study was to determine the effects of genotype and Dicamba concentrations on the embryo culture of bread wheat ***(Triticum aestivum L.).*** *Seven bread wheat cultivars were evaluated for their response to in vitro culture via culturing of their mature embryos as an explant in Linsmaier Skoog,(11) induction medium with different dicamba concentrations (2.5, 5, 7.5 and 10 mg^{-l}). The results of the study showed that the frequency of responding embryo was significantly influenced by the genotypes and dicamba concentrations. Callus induction rate, callus weight per petri dish were significantly affected by the genotypes. Depending on the genotypes, callus induction rate, callus weight mg/petri dish varied from 16.7 %-85.4 %, 29.1-261.9 respectively.*

Callus induction rate and callus weight were also significantly influenced by the dicamba concentrations. The cultured embryos on the LS medium containing 5 mg^{-l} of dicamba gave the highest values of callus induction rate (63.1 %) and also callus weight (155.1 mg/petri dish).

Introduction

In vitro culture of mature or immature embryos is the method of choice for producing abundant callus and sufficient shoot formation in cereals. Callus is an unorganised mass of plant cell for use of inducing *in vitro* plant regeneration, somaclonal variation and successful application of direct gene transfer techniques. The stimulation of cell division and callus formation is frequently a result of a complex interaction between endogenous and exogenous growth substances. Genetic background of donor plant (3, 9, 10, 13) and culture medium (6, 8, 16) are being the most important in wheat that affect the efficiency of *in vitro* culture response.

The aim of this study was to evaluate the effects of genotype and different Dicamba concentrations on the mature embryo culture of different bread wheat genotypes.

Materials and Methods

In this research; Seven bread wheat cultivars selected among the widely grown cultivars in Çukurova region were evaluated for their response to *in vitro* culture via culturing of their mature embryos as an explant in Linsmaier Skoog (11) induction medium with different dicamba (*3,6 dichloro-2 methoxybenzoic acid*) concentrations (2.5, 5, 7.5 and 10 mg^{l}).

Seeds were sterilized with 96% ethanol for 2 minutes and than sodium hypo chlorite solution (20 % available chlorine) added 2 drops of tween 80 per 100 ml solu-

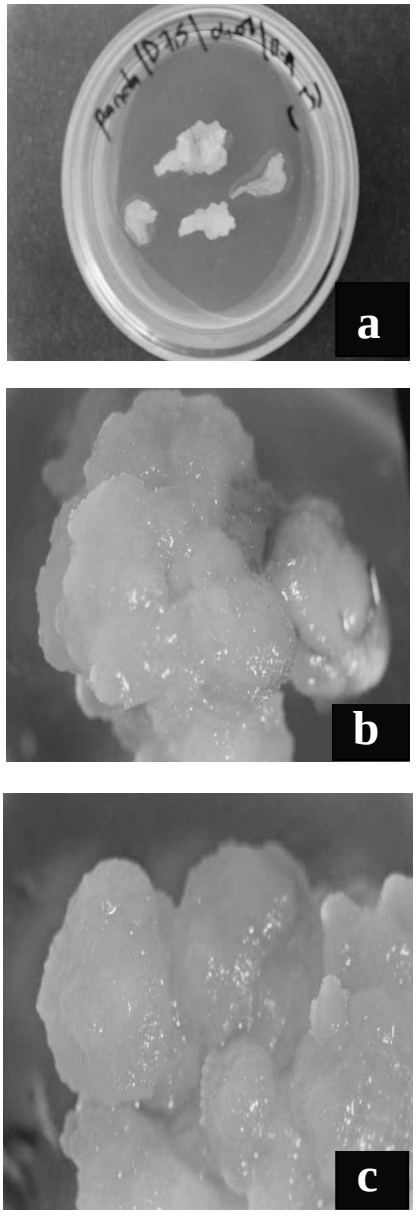

Fig.1. Callus formation from the mature embryos of bread wheat (*Triticum aestivum* L.). ***(a***) An expansion on the whole parts of the embryos (b) An appearance from the callus after three weeks later of the induction. (c) Fully calli after four weeks of the induction.

tion for 10 minutes and washed with sterile distilled water for 3 times. The mature embryos were isolated from the imbibed seeds about four hours later than sterilization and cultured in Linsmaier Skoog (11) induction medium with four concentrations (2.5, 5, 7.5 and 10 mg^{-l}) of Dicamba. The cultures were incubated at 26 ± 1 °C in dark. Embryos with calli and/or embryoids were counted and weighted after 4 weeks of incubation.

The experiment was designed in a split-split plot design with 3 replications. Each petri dish with 4 mature embryos was considered as a replication. The data on frequency of responding embryo was transformed via Arcsin$\sqrt{x}$ transformation. The transformed data were analyzed by using ANOVA.

Results and Discussion

We observed that an expansion on the whole part of the embryos one week after from the induction.

In 15th day, callus formation was observed from the expansion parts of the embryos (**Fig. 1a**). Three weeks after the incubation the soft and juice callus start to turn back to compact type (**Fig.1b**). After four weeks of culture duration, some cultures showed fully calli (**Fig. 1c**).

The Effects of Genotype

Callus induction rate differed according to genotype and ranged from 16.73% to 85.4 % (**Table 1**). Embryo taken from the genotype 2, originated from the cultivar Panda, produced statistically significant higher callus induction rate (%85.4) than genotype 3, 4, 6 and 7 originated from the cultivars Yuregir 89, Golia, Cumhuriyet 75 and Basribey. Other genotypes were not significantly different from the genotype 1 and 5. Originated from the cultivars Genc 99 and Seri 82.

TABLE 1

Effect of genotype on callus induction rate (%) and callus weight (mg/per petri dish) in immature embryo culture of bread wheat cultivars (*Triticum aestivum* L).

Genotype	Origin Cultivars	Callus Induction Rate (%)	Callus Weight (mg/per petri dish)
1	Genc 99	54.1 (46.3) $^{+}$ ab	95.9 bc*
2	Panda	85.4 (75.9) a	261.9 a
3	Yuregır 89	33.3 (30.2) b	99.0 bc
4	Golia	39.6 (36.3) b	69.2 bc
5	Seri 82	62.5 (54.9) ab	121.8 b
6	Cumhuriyet 75	29.1 (25.3) b	62.7 bc
7	Basribey	16.7 (15.4) b	29.1 c

* Means followed by the same letter in a column are not significantly different by Duncan's Multiple Range test at the P£0.05 level .

$^{+}$) Transformed values.

TABLE 2

Effect of Dicamba concentration on callus induction rate (%) and callus weight (mg/per petri dish) in immature embryo culture of bread wheat cultivars (*Triticum aestivum* L).

Dicamba Concentration	Callus Induction Rate (%)	Callus Weight (mg/per petri dish)
2.5 mg^{-1}	32.1 (28.8) $^{+}$ b	101.0 ab*
5 mg^{-1}	63.1 (56.3) a	155.1 a
7.5 mg^{-1}	48.9 (42.9) ab	91.2 b
10 mg^{-1}	39.3 (34.4) ab	75.2 b

*Means followed by the same letter in a column are not significantly different by LSD test at the p£0.05 level.

$^{+}$) Transformed values.

In this study, we found that different bread wheat genotypes revealed different callus induction rate. This result suggests that the induction of calli from embryo of wheat is under the genetically control. Similar findings are also observed on in vitro culturing of responding from anthers of various wheat species (1, 3, 5, 8, 12, 15).

Weight of callus formed from embryo of wheat cultivars differed according to genotypes (Table 1). Callus weight per petri dish ranged from 29.1 mg to 261.9 mg with respect to genotypes. Embryo taken from the genotype 2, originated from the cultivar Panda, produced statistically significant higher callus weight 261.1 mg than other genotypes. This variation trend in callus weight seemed similar to callus induction rate considering genotype 2.

The Effects of Dicamba Concentrations

Our findings showed that effect of dicam-

ba concentrations on callus formation is significantly different (**Table 2**).

$5mg^{-1}$ concentration of Dicamba produced the highest callus formation rate of 63.1 %. However, this is not statistically significant from $2.5mg^{-1}$ dicamba concentration. To usage of the dicamba concentrations higher or lower than $5mg^{-1}$ decreased the callus induction rate. Our findings about changes in callus induction rate with respect to Dicamba concentrations are in agreement with the results of Gland and Hatipoglu's (7) and Can et al. (4).

The callus weight formed from embryo of wheat cultivars differed according to dicamba concentrations (Table 2). Callus weight per petri dish ranged from 75.2 mg to 155.1 mg with respect to concentrations. (Table2). The increase in dicamba concentration from 5 to 10 mg^{-1} decreased the callus weight. The highest callus weight (155.1 mg) was obtained from $5mg^{-1}$ dicamba concentration and the lowest one (75.2 mg) from 10 mg^{-1} .

Our results are in corroboration with the earlier study in which application of high auxin concentration retarded the division of meristamtic cells (14).

Conclusions

In the investigation of the embryo culture of different bread wheat genotypes, it was concluded that genotype and dicamba concentration are important success factors. Our results suggest that LS medium with $5mg^{-1}$ dicamba can be successfully used for callus formed from embryo culture of different bread wheat genotypes.

Acknowledgements

This study was supported by the University of Mustafa Kemal and DPT of Turkey Project No: 2001K 120940.

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