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**Khair AN**  
Regional Research Station  
Anand Agricultural University  
Anand, Gujarat, India

**Bhanvadia A**  
Regional Research Station  
Anand Agricultural University  
Anand, Gujarat, India

## Flowering synchronization studies in parental lines of pearl millet hybrid GHB 905

**Khair AN and Bhanvadia A**

### Abstract

The present study investigated the effect of staggered sowing and foliar spray of fertilizer on synchronization of parents in pearl millet (*Pennisetum glaucum* L.) hybrid GHB 905 at Regional Research Station Farm, Anand Agricultural University, Anand, Gujarat during summer, 2018. The soil of experiment plot was loamy sand in texture, low in available N and soil organic carbon, high in available P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O. Split plot design was used to layout field plot with nine treatment combinations and four replications. Results revealed that closer synchronization of flowering in parental lines was achieved under sowing of male parent by four days earlier to female and foliar spray of urea @ 2% on male parent at 25 DAS. It was recorded significantly lower days to 50% flowering in male parent (49.25 days) that helped to bridge marginal gap of flowering between parents. It also obtained significantly higher hybrid seed yield (2172 kg/ha) with better quality seed traits.

**Keywords:** Staggered sowing, foliar spray of fertilizer and synchronization

### Introduction

Pearl millet (*Pennisetum glaucum* L.) is an important millet of India. It is grown in semi-arid tropical region of the world primarily in Asia and Africa (26 million hectares). In India, pearl millet is grown on 7.47 million hectares with production of 9.80 million tones and average productivity of 1312 kg/ha (Anon., 2017) [1]. Pearl millet is mainly cultivated in *Kharif* but at lesser extent, it is grown in Gujarat, Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu during the summer. In 2018, Gujarat produced 0.96 million tones of pearl millet from 0.39 million hectares of area with an average productivity of 2430 kg/ha (Anon., 2019) [2].

Hybrid seed production is a herculean task in view of its serious problems encountered in the form of non-synchrony in flowering. When both the parental lines do not flowering at the same time that is called non-synchronization of flowering. It cause poor set due to non-availability of pollen at the time of pollination period (Kumar and Merwade, 2012) [7, 8]. To solve the problem of non-synchronization of flowering some agro-techniques are adopted *viz.*, staggered sowing, planting row ratio, application of nitrogenous fertilizer, gibberellic, ABA, hydro-priming and controlled irrigation (Priyanka *at al.*, 2017) [9]. Nitrogen fertilization delays the maturity of crops as ascertained by Tisdale and Nelson (1966) [11] is not invariably true, as maturity is determined by the nature of the crop, nitrogen deficiency, quantity and time of nitrogen application. Hence, nitrogen application is likely to enhance the maturity (Shrivastava and Singh, 1969) [10].

The present study was taken to overcome problem of non-synchronization in parental lines of pearl millet hybrid GHB 905. The female parent (ICMA 04999) of this hybrid flowers seven to eight days earlier to its male parent (J 2454). A longer period of staggered sowing alone is not feasible to solve this obstacle, as it is difficult to perform other cultural operations. Therefore, other tools may practices *i.e.*, spraying of nitrogenous fertilizers as to the late flowering parent that may help to bridge the flowering gap between parents.

### Materials and Methods

The present investigation was conducted at Regional Research Station Farm, Anand Agricultural University, Anand, Gujarat during summer season of 2018. The soil of the experimental field was loamy sand in texture, low in organic carbon (0.26%) and available N (172.50 kg/ha) whereas medium in available P<sub>2</sub>O<sub>5</sub> (48.83 kg/ha) and K<sub>2</sub>O (233.72 kg/ha). The design of experiment was split plot. Nine treatment combinations comprised three staggered sowing levels *viz.*, M<sub>1</sub> (simultaneous sowing of male and female parent), M<sub>2</sub> (sowing of male parent by four days earlier to female) and M<sub>3</sub> (sowing of male parent by eight days earlier to female) and three foliar spray of fertilizer levels *viz.*, S<sub>1</sub> (water spray), S<sub>2</sub> (2% urea spray) and S<sub>3</sub> (2% DAP spray) at 25 DAS on male parent.

### Correspondence

**Khair AN**  
Regional Research Station  
Anand Agricultural University  
Anand, Gujarat, India

The foundation seed of female (ICMA 04999) and male (J 2454) parents of pearl millet hybrid GHB 905 were obtained from the Pearl millet Research Station, Jamnagar, Junagadh Agricultural University, Gujarat. Isolation distance of 200 meter was maintained between the experimental plot and other pearl millet crop to avoid cross-pollination. In each treatment, four rows of female and two rows of male were planted (4:2), two border rows of male parental seeds planted surround experimental plot. Male parent seeds were sown first in split as per treatment followed by simultaneous sowing of male and female parents. Prepared solution of fertilizers were sprayed on male parent line as per treatment with the help of plastic barrier to protect female parent line from drift.

### Results and Discussion

The staggered sowing treatments revealed non-significant variation on days to 50% flowering in both the parents (Table 1). Hence, foliar spray of fertilizer shown significant effect on day to 50% flowering of male parent only. Foliar spray of urea @ 2% at 25 DAS to male parent recorded significantly lower days to 50% flowering in male parent (51.17 days). It was at par with 2% DAP spray at 25 DAS to male parent (52.25 days). The plants sprayed with water at 25 DAS to male parent did not shown earliness in flowering and it recorded significantly higher days to 50% flowering (54.08 days). Foliar application of nitrogenous fertilizer at initiation of boot leaf stage of pearl millet helped to stimulate nitro-positive nature of crop. The physiological effect of nitrogen on early flowering may attributed to the development of leaves to the full potential that cause acceleration of photosynthesis, which finished vegetative phase earlier.

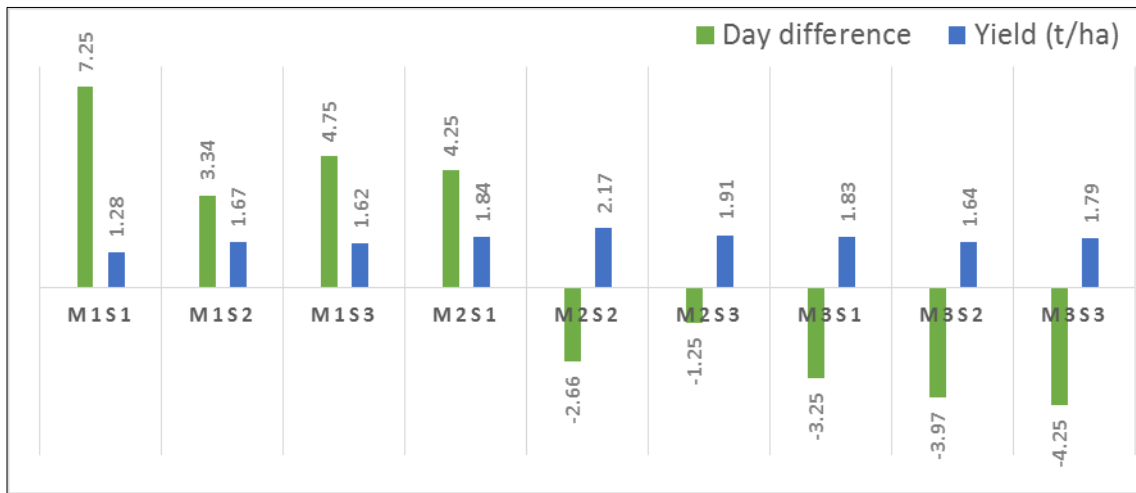
Consequently, the reproductive phase started earlier. After the emergence of a spike, flowering was beginning within 2-3 days. Kannababu and Rana (2003)<sup>[6]</sup>, Dhedhi *et al.* (2007)<sup>[5]</sup>, Bhanuje (2012)<sup>[3]</sup>, Kumar *et al.* (2012)<sup>[7]</sup> and Priyanka *et al.* (2017)<sup>[9]</sup> reported similar findings of early flowering through nitrogen fertilization.

The interaction of staggered sowing and foliar spray of fertilizer was significant for days to 50% flowering in male parent only but in case of female, it was non-significant (Table 1). Significantly, lower days 50% flowering was noticed under sowing of male parent by four days earlier to female and foliar spray of urea @ 2% at 25 DAS to male parent (49.25 days) and remained at par with sowing of male parent by four days earlier to female and foliar spray of DAP @ 2% at 25 DAS to male parent (50.50 days). Simultaneous sowing of both parent and water spray at 25 DAS to male parent recorded significantly higher days to 50% flowering (54.75 days).

The graphically presented data intimated inverse relationship between flowering day gap and hybrid seed yield (Fig. 1). The combined effect of staggered sowing and foliar spray of fertilizer reduced the flowering day gap between parental lines from 7.25 day to 2.66 day. It favors more pollination during reproductive phase that causes better seed setting, so closer synchronization of flowering was achieved under sowing of male parent by four days earlier to female and foliar spray of urea @ 2% at 25 DAS to male parent. In addition, it recorded 69.29% higher hybrid seed yield compared to simultaneous sowing of male and female parents. Bhanuje *et al.* (2014)<sup>[4]</sup> and Priyanka *et al.* (2017)<sup>[9]</sup> also reported similar results.

**Table 1:** Effect of staggered sowing and foliar spray of fertilizer on days to 50% flowering and hybrid seed yield

Treatments	Days to 50% flowering		Hybrid seed yield (kg/ha)
	Female	Male	
<b>Staggered sowing (M)</b>			
M <sub>1</sub> : simultaneous sowing of male and female parent	47.00	53.25	1523
M <sub>2</sub> : sowing of male parent by four days earlier to female	46.17	51.42	1973
M <sub>3</sub> : sowing of male parent by eight days earlier to female	47.50	52.83	1755
S. Em. ±	0.60	0.86	58.33
CD at 5%	NS	NS	201.85
CV%	4.40	5.68	11.54
<b>Fertilizer Foliar Spray (S)</b>			
S <sub>1</sub> : water spray	47.33	54.08	1653
S <sub>2</sub> : 2% DAP spray	46.33	51.17	1826
S <sub>3</sub> : 2% DAP spray	47.00	52.25	1772
S. Em. ±	0.49	0.46	52.74
CD at 5%	NS	1.38	NS
<b>Interaction (M×S)</b>			
M <sub>1</sub> S <sub>1</sub>	47.50	54.75	1283
M <sub>1</sub> S <sub>2</sub>	46.50	51.75	1665
M <sub>1</sub> S <sub>3</sub>	47.00	53.25	1619
M <sub>2</sub> S <sub>1</sub>	46.25	54.50	1841
M <sub>2</sub> S <sub>2</sub>	46.00	49.25	2172
M <sub>2</sub> S <sub>3</sub>	46.25	50.50	1907
M <sub>3</sub> S <sub>1</sub>	48.25	53.00	1834
M <sub>3</sub> S <sub>2</sub>	46.50	52.50	1642
M <sub>3</sub> S <sub>3</sub>	47.75	53.00	1790
S. Em. ±	0.84	0.80	91.36
CD at 5%	NS	2.39	271.45
CV%	3.60	3.06	10.44



**Fig 1:** Comparison of various treatment combinations for day difference of flowering and hybrid seed yield



M<sub>1</sub>S<sub>1</sub>: Simultaneous sowing of both parents and foliar water spray at 25 DAS only to male parent



M<sub>2</sub>S<sub>2</sub>: Sowing of male parent by four days earlier to female and 2% urea spray at 25 DAS only to male parent

**Plate 1:** Treatments wise plot view at flowering stage

### Conclusion

It can be concluded that sowing of male parent by four days earlier to female and foliar spray of urea @ 2% at 25 DAS to male parent was found effective practice to achieving flowering synchronization in parental lines of pearl millet hybrid GHB 905. Further, this helped to get higher hybrid seed yield with better quality seed traits.

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