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Research Article

Sunflower COH 3: A high yielding and high oil content sunflower hybrid for Tamil Nadu

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Abstract
Development of hybrids in sunflower are increasing recently since, the hybrids are highly self-fertile, stable, high yielding and more uniformity under different climatic conditions. Sunflower hybrid COH 3 (CSFH 12205) have been released during 2018 which is suitable for Tamil Nadu with the duration of 90-95 days. COH 3 hybrid was tested in Station Trials, Multi-Location Trial, AICRP Trials, Adaptive Research Trial and On Farm Trials. It performed well both under rainfed and irrigated conditions. Sunflower COH 3 recorded an average yield of 2214 kg/ha which is 20.5 per cent over Sunbred 275 and hybrid having the yield potential of 2384 kg/ha during *Kharif* season and 2043 kg/ha during *Rabi*. COH 3 hybrid possessing high oil content around 42 per cent as compared to check hybrids *viz.*,Sunbred 275 (38%) and Hybrid CO 2 (39 %) and high volume weight of 47 g/100ml. This hybrid recorded the highest oil yield of 716 kg/ha which is 26.7 and 20.1 per cent over Sunbred 275 (565 kg/ha) and CO 2 Hybrid (596 kg/ha), respectively. Non-lodging hybrid COH 3 having moderate resistance to necrosis, leaf spot and powdery mildew diseases.

Key words
Sunflower hybrid, COH 3, high yield, oil content

INTRODUCTION

Sunflower is a significant oilseed crop which serves up to 12 per cent of the global vegetable oil production. It is the second most important crop based on the hybrid breeding, after maize.Until 1970's sunflower production was only based on the open pollinated varieties. The concept of heterosis breeding have intensified after the discovery of cytoplasmic male sterile source (Leclercq, 1969) and identification of corresponding fertility restorer genes (Kinman, 1970). Development of hybrids in sunflower is increasing recently since, the hybrids are highly self-fertile, stable, high yielding and more uniformity under different climatic conditions (Manivannan*et al.*, 2017). Hybrids are more preferred by the farmers than varieties because of its high yield potential, homogeneity and uniform at maturity. Recently, promising and trait specific *cms* lines and restorers are developed for advancing sunflower hybrids with higher yield, oil content, confectionary purpose and hybrids with a changed fatty acid profile (Sasikala*et al.*, 2020).

MATERIALS AND METHODS

A CGMS line, COSF6A and a multi-head restorer line, IR6 were crossed and designated as CSFH 12205 during 2012 at the Department of Oilseeds, TNAU, Coimbatore. Based on the performances in preliminary (*Kharif* 2012 and *Rabi* 2012-13) and advanced hybrid yield trials (*Kharif* 2013 and *Rabi* 2013-14) in station, this hybrid was promoted to Multi-Location Trial during 2014-2015 followed by Adaptive Research Trials (2015-2017). Simultaneously this hybrid was also tested in All India Coordinated Trials (2014-2016) and On Farm Trials (2017).

RESULTS AND DISCUSSION

The sunflower hybrid COH 3 is developed from a cross between a male sterile line COSF 6A and multi head restorer line IR6. It is a high yielding hybrid with a high oil content and high volume weight. It matures in 90-95 days. It performed well both under rainfed and irrigated condtitions. Hybrid COH 3 recorded an average yield of 2214 kg/ha which is 20.5 per cent over Sunbred 275 and hybrid having the yield potential of 2384 kg/ha during the *Kharif* season and 2043 kg/ha during *Rabi*. It possess high oil content around 42 per cent as compared to check hybrids *viz.,*Sunbred 275 (37%) and Hybrid CO 2 (38 %) and high volume weight of 47 g/100ml.This hybrid recorded the highest oil yield of 716 kg/ha which is 26.7 and 20.1 per cent over Sunbred 275 (565 kg/ha) and CO 2 Hybrid (596 kg/ha), respectively. COH 3 hybrid was tested in Station Trials, Multi-Location Trial, Adaptive Research Trials, On Farm Trials and ICAR Co-ordinated Trial along with the popular hybrid checks like Sunbred 275 and Hybrid CO 2. Because of the yield superiority and high oil yielding nature, this hybrid CSFH 12205 was released as sunflower COH 3 hybrid by the State Variety Release Committee during 2018 for Tamil Nadu (Notification No.:S.O.6318(E)).

Under Station Trial the COH 3 recorded 2384 kg/ha seed yield during *Kharif*. It was 27.6 and 17.5 per cent increase over Sunbred 275 (1868 kg/ha) CO 2 Hybrid (2029 kg/ha), respectively. During *Rabi,* it recorded 2038 kg/ha seed yield which was 12.8 per cent increase over Sunbred 275 (1807 kg/ha) (**Table 1**).

In multi-location trials, sunflower hybrid COH 3 recorded 2080 kg/ha during *Kharif*. The yield represented an increase of 16.3 and 21.5 *per cent* over Sunbred 275 (1789 kg/ha) and CO 2 Hybrid (1711 kg/ha), respectively. During *Rabi*, this hybrid recorded 1671 kg/ha which was 14.4 and 13.6 per cent over Sunbred 275 (1461 kg/ha) and CO 2 Hybrid (1471 kg/ha), respectively (**Table 1**). Under Adaptive Research and On Farm Trials the hybrid COH 3 recorded an average seed yield of 1270 kg/ha during *Kharif* which was 10.5 and 10.0 per cent higher than Sunbred 275 (1150 kg/ha) and CO 2 Hybrid (1154 kg/ha), respectively (**Table 1**).

Under All India Coordinated Trial the hybrid COH 3 recorded 1720 kg/ha during *Kharif* season. It was 8.5 per cent increased seed yield over DRSH1 (1586 kg/ha) and also COH 3 recorded an increased oil yield of 686 kg/ha over national check hybrids *viz.,* KBSH44 (559 kg/ha), DRSH1 (622 kg/ha) and LSFH171 (533 kg/ha) which was 22.8, 10.3 and 28.7 per cent increase, respectively (**Table 2**).

Table 1. Overall performance of sunflower hybrid COH 3 in various trials for seed yield (kg/ha)

Name of the trial	Number of locations	COH3	Sunbred 275	CO 2 Hybrid
Kharif				
Station trials	2	2384	1868	2029
MLT	14	2080	1789	1711
Rabi				
Station trials	2	2043	1807	2215
MLT	14	1671	1461	1471
AICRP trials (IHT, AHT-I & AHT-II)*	38	1720	-	-
Pooled ARTs (2015 & 2016)	43	1270	1150	1154
On Farm Trials	16	2032	1777	1801
Weighted mean (91)		**1627**	**1433**	**1445**
% increase over			**11.4**	**11.3**

* AICRP trials data are not included for calculation of overall mean.

Table 2. Performance of COH 3 in AICRP trials during *Kharif* season - Seed yield (kg/ha)

Trial	Locations	COH3	KBSH 44	DRSH 1	LSFH 171
IHT (*Kharif*-14)	16	1823	1801	1692	-
AHT 1(*Kharif*-15)	12	1770	1566	1582	1655
AHT 2(*Kharif*-16)	10	1497	1717	1422	1748
Mean (38)		1720	1705	1586	1697
% increase over			0.93	8.46	1.37

COH 3 hybrid has high oil content of 42 per cent as compared to other hybrids viz., Sunbred 275 (38.0%) and hybrid CO2 (39 %) on seed basis (**Table 3**). It also recorded a high volume weight (47 g/100 ml) when compared to other check hybrids Sunbred 275 (38 g/100 ml) and TCSH 1 (47.5 g/100 ml). This hybrid recorded the highest oil yield of 716 kg/ha which is 26.7 and 20.1 per *cent* over Sunbred 275 (565 kg/ha) and CO 2 Hybrid (596 kg/ha), respectively (**Table 4**).

The hybrid COH 3 recorded a moderate resistant reaction to leaf spot disease severity (22.2 PDI) while checks Sunbred 275 (33.3 PDI) and CO 2 Hybrid (28.8 PDI) recorded a susceptible reaction (**Table 5**). It recorded a moderately resistant reaction to powdery mildew disease severity (23.7 PDI) while checks Sunbred 275 (34.8 PDI) and CO 2 Hybrid (41.4 PDI) recorded a susceptible reaction. The hybrid COH 3 recorded a moderately resistance to necrosis disease (18 PDI) when compared to Sunbred 275(32 PDI) and CO 2 Hybrid (30 PDI) respectively (**Table 5**).

The hybrid COH 3 recorded a less incidence of Thrips (4.2 per plant) and Leaf Hopper (10 per plant) when compared to Sunbred 275 (13.1 per plant) and CO 2 Hybrid (10.8 per plant). *Helicoverpa* incidence was also less in COH 3(0.3/plant) compared to Sunbred 275 (1/plant) and CO 2 Hybrid (0.5/plant)(**Table 6**). Distinguishing morphological characters of parental lines of the hybrid and the hybrid are depicted in **Table 7 and 8**.

Table 3. Oil and other quality parameters of sunflower hybrid COH 3

Item	COH3	Sunbred 275	CO 2 Hybrid
Oil content (%)	42	38	39
Hull content (%)	27.0	32.0	28.5
100 seed weight (g)	5.2	4.5	5.9
Volume weight (g/100ml)	47.0	39.6	48.0

Table 4. Estimated oil content and oil yield of hybrid COH 3 during *Kharif* and *Rabi*

Item	COH3	Sunbred 275	CO 2 Hybrid	% increase over Sunbred 275	% increase over CO 2 Hybrid
Oil content (%)	41.3	36.5	37.8	**7.3**	**3.8**
Rabi	42	38.5	39.8	**15.1**	**11.1**
Oil yield (kg/ha)					
Kharif	666	548	565	**21.7**	**18.0**
Rabi	765	582	626	**31.4**	**22.2**
Average oil yield (kg/ha)	**716**	**565**	**596**	**26.7**	**20.1**

Table 5. Disease reaction of sunflower hybrid COH 3 during *Kharif* 2016 under artificial net house conditions

Disease	COH3	Sunbred 275	CO 2 Hybrid
Necrosis **(PDI)**	18	32	30
Leaf spot **(PDI)**	22.2	33.3	28.8
Powdery mildew **(PDI)**	23.7	34.8	41.4

Table 6. Pest reaction of sunflower hybrid COH 3 during *Kharif* 2016 under field condition

Pest	COH3	Sunbred 275	CO 2 Hybrid
Thrips/ 3 leaves/plant	4.2	13.1	10.8
Leaf hopper / 3 leaves/ plant	7.3	14.5	12.2
Helicoverpaarmigera/ head	0.3/plant	1.0/plant	0.5/plant

Table 7. Distinguishing morphological characters of parental lines of the hybrid

Characters	COSF 6A (Female parent)	IR 6 (Male parent)
Plant height (cm)	150-155	125-130
Duration	80-85 days	90-95 days
Stem	Mostly green colour stem & Non-branching	Mostly green colour stem &overall Branching
Leaves	20 – 25 leaves, Slightly serrated,cordate and dark green leaves	10 – 15 leaves slightly serrated, lanceolate and light green leaves
Pigmentation	No purple pigmentation on the stem and petiole	Nopurple pigmentation on the stem and pigmentation observed on petiole
Flower	Ray florets are medium and yellow, white stigma	Ray florets are few and light yellow, stigma is light yellow in colour
Head	Convex head	Flat head

Table 8. Distinguishing morphological characters of hybrid

Characters	COH3
Plant height (cm)	160-170
Maturity	55-58 days (50% flowering) 90 -95 days (seed to seed)
Leaves	Medium size green colour cordate leaves with and moderately serrated leaf margin
Stem	Green colour with few basal branching
100-seed weight (g)	5.0-5.5
Hull content (%)	26.0 – 28.0
Oil content (%)	40-42
Volume weight (g /100 ml)	45 – 47
Head	Medium size head with diameter of 18-20 cm and convex shape with attitude of half turned down
Seed	Medium size elongated black colour seed without stripes

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