

Seed Tech News



ISST:
**Disseminating Knowledge of
Seed Science & Technology**

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The spectacular once-in-a-lifetime “death bloom” of the *Agave montana* L. at Kew Gardens underscores the fragile reproductive lifecycle of monocarpic succulents. As the towering plant expends its final energy to flower before dying, horticulturists actively seek a viable pollen partner. Securing cross-pollination is vital for producing viable seed, which plays a crucial role in propagating a new generation of this rare species and maintaining its sustainable presence in global botanical collections.

Secretary : Dunna Vijay
Editor : Manjunath Prasad
Associate Editor : Sanjay Kumar

From President's Desk...

Dear Members,

Greetings from the President's Desk!

This quarter offers encouraging progress in implementing the General Body's programme. Our emphasis remains on sustained scientific engagement, professional development and institutional capacity, building on successive Councils' contributions.

The Executive Council's review on 8 August recorded 21 new life members and three annual members since April, student outreach at ICAR-IARI and QR-code payment facilities. The evaluation proforma for *Seed Research* was submitted for NAAS scoring on 31 July, and Dr Nandita Banerjee was identified for additional editorial support. Receipt of ₹10 lakh from BISA/CIMMYT supported renovation of the new office premises. These encouraging developments demand sustained attention to publication quality and institutional improvement.

The inaugural National Seed Lecture was announced for 11 September, featuring Dr. Steven Groot, Senior Researcher, WUR, The Netherlands, on “*Advantages of Hermetic Seed Storage*”. The Executive Council also agreed to organise a national seed symposium in collaboration with UAS Bengaluru during 2026-2027, with exact dates to follow. These platforms should connect research experience with practical questions in seed production and quality management.

Strengthening professional opportunities is equally important. The General Body meeting held in May resolved to seek consideration of seed science postgraduates for relevant positions in Krishi Vigyan Kendras, the Directorate of Plant Protection, Quarantine and Storage, and other seed-service institutions. It also endorsed representations to ICAR and agricultural universities concerning recruitment of appropriately qualified seed science personnel for teaching and research. We shall pursue these matters constructively, demonstrating specialised training's contribution to institutional performance.

Regulatory developments underline this need for expertise. The TAAS-ICAR-FSII roundtable on 25 July called for predictable, science-based approval procedures for genetically modified and genome-edited crops without compromising biosafety. The PPV&FR Authority's notice dated 31 August announced amended distinctness, uniformity and stability test guidelines for 36 crop species, effective from 1 October. Our scientific exchanges should help professionals understand these changes and their practical implications.

Internationally, FAO's *The State of Agricultural Commodity Markets 2026*, launched on 9 July, examined how shocks spread through agricultural trade networks. This reinforces the value of dependable partnerships and diversified supplies alongside stronger domestic capabilities. Research, quality assurance and trade cooperation should support one another.

Within the Society, we shall work towards associating at least ten seed companies during this Council's tenure, while respecting the General Body's decision to consolidate existing activities before establishing regional chapters. We shall pursue government recognition of National Seed Day. I encourage research guides to support strong student contributions to *Seed Research* and nominations for the Padma Bhushan Dr. R. S. Paroda Award for the best thesis.

Our progress will be measured by the quality of our scientific contributions and their usefulness to society. I seek your continued participation in building an ISST that supports young professionals, strengthens collaboration and advances farmers' access to reliable seed.

With warm personal regards.

Dr. D. K. Yadava
President, ISST

Bio-efficacy of Bioactive-Loaded Nanofibre Seed Coating in cotton

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BIOACTIVE-LOADED NANOFIBRE COATINGS were evaluated in cotton (CO 14). Gibberellic acid (GA₃)-loaded polyvinyl alcohol/sodium alginate nanofibres recorded 75% germination under normal laboratory conditions and 63% in the polyethylene glycol (PEG)-stress dataset, compared with 65% and 47%, respectively, in untreated seeds. Tebuconazole-loaded nanofibres recorded 97.8% inhibition of *Fusarium oxysporum* in vitro. The results indicate potential for seed enhancement, while release behaviour, field disease control and performance under soil-water stress require further validation.

Keywords: cotton, seed coating, electrospinning, nanofibres, gibberellic acid, tebuconazole

Introduction

Establishment begins when the seed takes up water and resumes growth. Germination and subsequent seedling development depend on coordinated physiological processes, including hormonal regulation [1]. In cotton, the transition from sowing to an established seedling can be constrained by inadequate moisture and pathogen pressure. A seed treatment intended for this stage must therefore be considered in relation to both physiological performance and protection of the developing plant.

Seed coating associates selected materials with the seed surface before sowing. It offers an opportunity to position a growth-promoting or protective compound close to the germinating seed. However, the coating is not merely an inert vehicle: its composition and physical structure are part of the treatment. Untreated seeds and seeds receiving the carrier alone therefore provide important controls.

Electrospun nanofibres provide a fibrous alternative to conventional seed-treatment carriers. Their use for delivering plant growth regulators has been investigated in groundnut and black gram [2]. The present study used polyvinyl alcohol (PVA) with sodium alginate (SA). Research on PVA/SA blends shows that fibre formation and behaviour in water depend on the composite and its processing [3]. Those properties must be established for the seed-coating formulation rather than assumed from the polymer names alone.

Gibberellins support germination and embryo growth. In *Arabidopsis*, gibberellin biosynthesis interacts with abscisic acid during imbibition [1]. This provides physiological context for testing GA₃, although the present cotton study assessed seed responses rather than the underlying hormonal pathways.

GA₃ and tebuconazole were selected for different purposes. GA₃ was evaluated for germination and early seedling growth, whereas tebuconazole was evaluated as

an antifungal bioactive. Previous work with tebuconazole-loaded PVA fibres in black gram provides a separate example of this delivery approach [4]. Here, the objective was to characterise PVA/SA fibres and assess their association with cotton seed performance under normal and PEG-induced stress conditions, together with in vitro antifungal activity.

The Nanofibre Seed-Coating Concept

Electrospinning uses a high-voltage electric field to draw fine fibres from a polymer solution. The resulting network can carry a bioactive compound within a fibrous matrix. In this study, the proposed PVA/SA coating was intended to retain the selected bioactive near the seed and facilitate its availability during imbibition. The matrix, the compound and the application conditions together constitute the treatment under evaluation.

The reported treatments contained GA₃ or tebuconazole separately; they did not test a combined formulation. The biological questions were correspondingly distinct: whether a coating was associated with improved germination and growth, and whether the fungicide-loaded material inhibited fungal growth. Neither question alone establishes sustained release. A favourable seed response or antifungal assay result must be distinguished from direct measurement of the amount and timing of bioactive release.

Materials and Methods

Plant material and treatments

Cotton cultivar CO 14 was used. The four treatments were untreated seeds (T₀), seeds with unloaded PVA/SA composite nanofibres (T₁), seeds with GA₃-loaded fibres labelled 100 ppm (T₂), and seeds with tebuconazole-loaded fibres labelled 750 ppm (T₃). These treatment identities were retained for both physiological datasets. The unloaded coating served as the carrier control and the untreated seeds as the baseline.

Nanofibre preparation and seed coating

PVA and sodium alginate (SA) were blended at a 7:3 ratio to prepare the polymer solution. Polyvinyl alcohol (PVA) with molecular weight of 1,25,000g/mol was purchased from M/s. HiMedia Laboratories Mumbai (India). GA₃ (100 ppm) or tebuconazole (750 ppm) was incorporated into the solution, and the resulting formulations were subjected to electrospinning at an applied voltage of 25 kV with a needle-to-collector distance of 15 cm. The generated bioactive-loaded fibres were deposited directly onto cotton seeds to form a coating. The coated seeds were then collected for further evaluation.

Characterisation

Scanning electron microscopy (SEM) and transmission electron microscopy (TEM) were used to examine the fibres. The reported observations covered surface appearance and fibre diameter. Fourier-transform infrared spectroscopy (FT-IR) was used to examine the composite and associated bioactives. Encapsulation efficiencies were also reported. Morphology, chemical characterisation and bioactive incorporation address different aspects of the carrier and should be interpreted together rather than as interchangeable measures. As an analytical framework, microscopy describes fibre form and dimensions, whereas infrared spectra provide information on functional groups and their chemical environment [3]. Encapsulation efficiency concerns the proportion of a bioactive incorporated into the carrier, with its interpretation dependent on the analytical procedure and calculation basis. It is distinct from the total coating quantity placed on the seed. These distinctions clarify the purpose of the reported measurements without supplying an unreported preparation or measurement protocol.

Physiological evaluation

Germination, seedling length and vigour index were assessed under normal laboratory conditions and PEG-induced moisture stress. Germination indicates the proportion responding in the test, while seedling length describes early growth. The vigour index is presented as supplied because its calculation procedure was not stated. The PEG dataset is reproduced under the original table label, -10 bar.

Basis of the stress test

PEG solutions are used to impose an osmotic constraint on water availability. Methodological work on PEG-6000 established that solution concentration and temperature influence osmotic potential [5]. This explains why those specifications matter when reporting a PEG test; it does not establish that PEG-6000, or any particular preparation method, was used here. A laboratory osmotic test also does not reproduce all conditions encountered by seeds in soil.

Antifungal assessment

The antifungal activity of the tebuconazole-loaded PVA/SA fibres against *Fusarium oxysporum* was evaluated using the poisoned food technique. The assay was conducted using Potato Dextrose Agar media incorporated with bioactives loaded nanofibre. A mycelial plug of 0.9mm obtained from an actively growing fungal culture was placed on the medium. The plates were incubated at 18 °C for 7 days, and the experiment was performed with 3 replicates per treatment. The treatments included an untreated control, unloaded PVA/SA fibres, GA₃-loaded fibres and tebuconazole-loaded fibres. Fungal colony growth was measured in centimetres and compared with the untreated control.

Estimation of encapsulation efficiency

Encapsulation Efficiency of GA₃ entrapped in PVA/SA nanofibre was estimated using standard graphs. 30 x 30 cm nanofibre was dissolved in 10 ml of ethanol and homogenized constantly with magnetic stirrer for 10 min @ 400 rpm under room temperature. Optical Density of the samples was measured at 270 nm for GA₃. Ethanol, water, Sodium alginate and PVA blend was used as the reference. The OD values were compared with standard graph to arrive the respective concentration. The encapsulation efficiency was calculated using the given formula.

Experimental and statistical reporting

Genetically and physically pure seeds of Cotton var. CO 14 were obtained from Department of cotton, Tamil Nadu Agricultural University, Coimbatore. The germination experiment was conducted in a germination room maintained at 10°C using a Factorial completely randomized design (CRD) with five replications of 25 seeds per treatment. Germination and seedling growth parameters were assessed after seven days. Germination percentage and seedling length were recorded, and the seedling vigour index was calculated using the recorded germination percentage and seedling length. The reported standard error of difference (SEd) and critical difference (CD) values at the 5% significance level were retained unchanged.

Results*Nanofibre characterisation*

The fibres were described as smooth, uniform and beadfree. Diameters were 186.5-212.4 nm by SEM and 94-119 nm by TEM. Bioactive loading was associated with increased diameter, and FT-IR analysis was reported to indicate interactions among polymer components and bioactives (Figure 1). Encapsulation efficiencies were 32.40% for GA₃ and 39.50% for tebuconazole. The two diameter ranges are retained separately rather than combined into a single estimate.

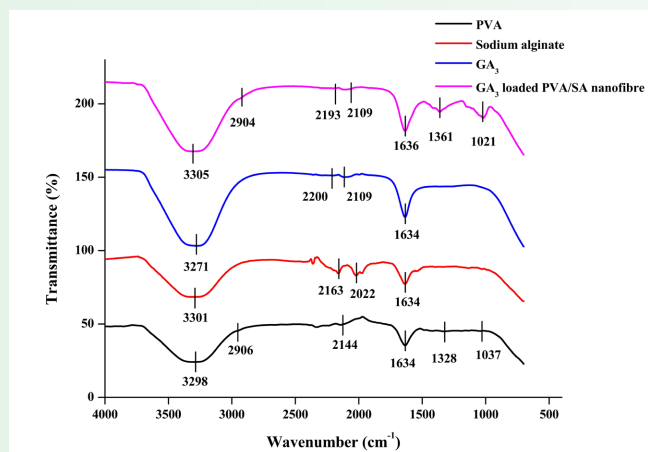


Figure 1. FTIR spectra of the Nanofibre and its components

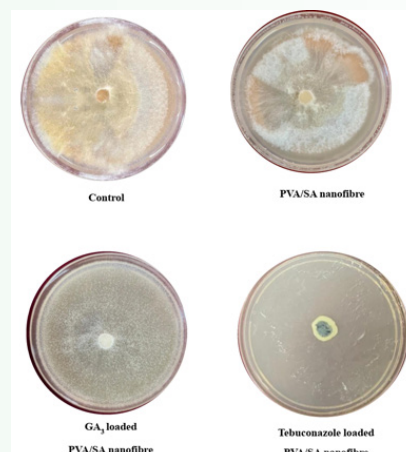


Figure 2. Bio-efficacy of bioactive-loaded PVA/SA composite nanofibres against *Fusarium oxysporum*. Original assay image.

Table 1. Effect of bioactive-loaded nanofibre coating on cotton seed quality under normal conditions.

Treatment	Germination (%)	Seedling length (cm)	Vigour index
T ₀ - Untreated control	65	18.4	1196
T ₁ - Unloaded PVA/SA nanofibres	69	20.8	1372
T ₂ - GA ₃ -loaded PVA/SA nanofibres (100 ppm)	75	28.1	2107
T ₃ - Tebuconazole-loaded PVA/SA nanofibres (750 ppm)	73	26.0	1898
SEd	3.02	0.19	76.8
CD (P = 0.05)	6.15	0.41	159.2

Table 2. Effect of bioactive-loaded nanofibre coating on cotton seed quality under PEG-induced moisture stress (-10 bar).

Treatment	Germination (%)	Seedling length (cm)	Vigour index
T ₀ - Untreated control	47	14.48	680
T ₁ - Unloaded PVA/SA nanofibres	52	15.51	806
T ₂ - GA ₃ -loaded PVA/SA nanofibres (100 ppm)	63	19.85	1250
T ₃ - Tebuconazole-loaded PVA/SA nanofibres (750 ppm)	57	18.60	1060
SEd	2.86	1.26	71.4
CD (P = 0.05)	5.72	2.54	142.8

SEd, standard error of difference; CD, critical difference. Treatment values and statistics are reproduced as reported.

Antifungal activity

Tebuconazole-loaded PVA/SA nanofibres labelled 750 ppm recorded 0.2 cm mycelial growth and 97.8% inhibition of *Fusarium oxysporum* in the poisoned food assay (Figure 2). This is evidence of in vitro antifungal activity of the tested material, not a measurement of disease control in cotton plants.

Seed performance under normal conditions

GA₃-loaded fibres recorded the highest germination (75%), compared with 65% in untreated seeds, an increase of 10 percentage points. Their seedling length was 28.1 cm and reported vigour index was 2107. Tebuconazole-loaded fibres recorded 73% germination, 26.0 cm seedling length and a vigour index of 1898 (Table 1). The unloaded carrier recorded 69% germination, providing an additional comparison for the loaded coatings.

Seed performance under PEG-induced stress

In the PEG-stress dataset, GA₃-loaded fibres recorded 63% germination, compared with 47% in un-treated seeds, a difference of 16 percentage points. Their seedling length and reported vigour index were 19.85 cm and 1081. The corresponding values for tebuconazole-loaded fibres were 57%, 18.60 cm and 993 (Table 2). These are the reported values for the supplied dataset, not reconstructed results for additional stress levels.

Discussion

Physiological and antifungal responses

GA₃-loaded coatings gave the highest numerical seed-quality values in both datasets. This is consistent with their intended growth-promoting role and with earlier investigation of hormone-loaded PVA carriers in other crops [2]. It does not identify the physiological mechanism

in CO 14: enzyme activity, endogenous hormone status and antioxidant responses were not reported. The unloaded carrier also exceeded the untreated control numerically, supporting its inclusion in future comparisons.

The tebuconazole formulation combined higher seed-quality values than the untreated control with fungal inhibition in a separate assay. Without a pathogen-challenged cotton experiment, disease suppression cannot be identified as the cause of the seedling response. Latha et al. [4] provide relevant comparative evidence from black gram, but their release and disease findings cannot be transferred to this PVA/SA formulation or cotton wilt.

Numerical ranking and stress interpretation

Numerical superiority should be distinguished from statistical significance. Under normal conditions, the difference in germination percentage between the GA₃ and tebuconazole treatments was 2 percentage points, below the reported critical difference (CD) of 6.15. Under PEG-induced stress, the difference in seedling length was 1.25 cm, below the reported CD of 2.54. Similarly, the difference in vigour index between these treatments was 88, below the reported CD of 142.8. These comparisons indicate that the observed numerical differences do not establish statistically significant differences, provided that the reported CD values are applicable to the respective treatment comparisons. The comparison scale, experimental design and statistical model should therefore be verified against the original analysis before drawing definitive conclusions.

Germination percentage decreased under PEG-induced osmotic stress compared with normal conditions across all treatments, while the GA₃ formulation retained the highest numerical germination value under stress. This trend warrants further investigation into its potential to support seed germination under restricted water availability. However, the findings should not be extrapolated to untested stress levels or interpreted as evidence of field-level drought tolerance. The reported -10 bar stress label must also be verified, and the distinction between PEG-induced osmotic stress and soil water deficit should be maintained when interpreting the results.

Limitations and future development

Encapsulation efficiency describes incorporation of a bioactive, not the duration of its release. Fibre appearance and diameter likewise do not establish sustained delivery. PVA/SA materials can change on contact with water [3], so formulation-specific release measurements are necessary. Dose-matched conventional GA₃ and tebuconazole treatments would also be needed to determine whether the nanofibre carrier offers an advantage over the active compounds alone.

Further development should define the coating dose and

composition, reconcile data calculations and repeat the assessment with fully reported methods. Priorities include coating integrity, storage safety, release under relevant moisture conditions and soil emergence. Pathogen-challenge and field evaluations are necessary to assess cotton-wilt control, alongside direct evaluation of environmental and economic performance.

Conclusions

Bioactive-loaded PVA/SA nanofibres showed potential for cotton seed enhancement in the reported laboratory evaluations. GA₃-loaded coatings produced the highest numerical germination and seedling-growth responses under normal conditions and in the PEG-stress dataset. Tebuconazole-loaded fibres inhibited *Fusarium oxysporum* in vitro. These findings support the distinct growth-promotion and antifungal objectives of the two treatments, without demonstrating a combined codelivery effect.

The findings warrant further validation rather than an immediate recommendation for farm use. Reproducible preparation and testing, data reconciliation, and direct assessment of release and seed safety are required. Evaluation under soil, storage and pathogen-challenge conditions will determine whether the laboratory responses translate into reliable establishment and practical seed treatment benefits.

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Scientific Breakthroughs

A Shared Starch Pathway Links Rice Chalkiness and Seed Vigour

A natural regulatory variant links starch breakdown with both chalky grains and vigorous germination, exposing a trade-off that breeders need to manage rather than overlook.

A rice grain must store reserves efficiently and later mobilise them to establish a seedling. These requirements can create a trade-off between appearance and seed performance. Xiaoli Chen and colleagues, reporting in *Nature Genetics*, identified *OsTPS8* as a molecular link between grain chalkiness and seed vigour, showing how enhanced starch breakdown can impair grain appearance while supporting germination.

The investigation centred on C50, a line carrying an indica IR24 chromosome segment in the japonica Asominori background. C50 produced chalkier grains with loosely packed starch granules containing small surface holes. Genetic mapping and transgenic experiments identified the underlying locus as *OsTPS8*, a member of the trehalose-6-phosphate synthase family. The starch abnormalities pointed towards increased degradation rather than a simple failure of starch synthesis.

Despite its family designation, *OsTPS8* showed no detectable conventional synthase activity in the assays. Instead, it interacted with and inhibited *OsTPS1*, an active enzyme producing trehalose-6-phosphate (Tre6P), a signal associated with carbohydrate metabolism. Higher *OsTPS8* expression lowered Tre6P and increased expression of *OsMYBS1* and alpha-amylase genes, promoting starch degradation. Reducing *OsTPS1* in the endosperm reproduced the low-Tre6P, chalky-grain phenotype, supporting the proposed mechanism. The precise molecular connection between Tre6P and downstream transcription remains unresolved.

Natural promoter variation helped explain differences among rice groups. Analysis of 331 cultivated accessions identified two major *OsTPS8* haplotypes, represented by Asominori and IR24. A single nucleotide difference altered promoter recognition by the transcription factor *OsbHLH001*, with the IR24-type promoter supporting stronger activation. Editing this position in Asominori increased *OsTPS8* expression and chalkiness, providing causal evidence. Coding-sequence differences also affected protein behaviour, so promoter variation is important but not the sole source of functional diversity.

The same pathway supported seed performance. C50, lines with elevated *OsTPS8* expression and promoter-edited

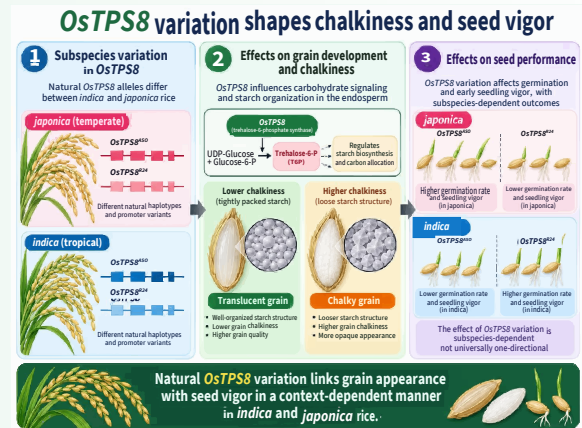


Figure 1. *OsTPS8* promotes starch degradation, linking increased rice grain chalkiness with greater seed vigor.

plants showed faster germination or stronger early growth under the tested conditions. Introducing an indica *OsTPS8* region into another japonica background increased both chalkiness and vigor. Tests involving 83 accessions further supported the association between the IR24-type haplotype and greater vigor. Sugar measurements were consistent with enhanced reserve mobilisation in several comparisons, although increases were not significant for every sugar in every genetic background. Population analyses indicated preferential selection of the IR24-type haplotype during indica domestication. The authors suggest that advantages in germination and establishment helped favour its retention despite the appearance penalty. This is an interpretation supported by genetic and functional evidence, rather than direct evidence of historical selection decisions. It illustrates how a grain-quality disadvantage can accompany a benefit elsewhere in the crop's life cycle.

For breeding and seed industries, the result argues for evaluating chalkiness and vigor together. The authors propose combining the vigorous haplotype with grain-shape alleles associated with reduced chalkiness, but a successful combination was not demonstrated. Likewise, lowering *OsTPS8* to improve appearance requires checking germination. The study provides a defined pathway for managing the trade-off between reserve preservation during grain development and reserve mobilisation during establishment.

Research source

Chen, X., Ren, Y., Dong, H., Jiang, X., Zheng, X., et al. (2026). Natural variation in *OsTPS8* confers differential regulation of chalkiness and seed vigor in indica and japonica rice. *Nature Genetics*, 58, 206-217. Published online 15 December 2025. DOI: 10.1038/s41588-025-02429-2

ScScientific Breakthroughs

ECAP Strengthens the ABA Signal That Restrains Germination

An adaptor protein helps Arabidopsis reinforce ABA-responsive gene activity, revealing how a familiar germination regulator receives additional support.

Whether a seed germinates depends not only on hormone abundance but also on how strongly its cells interpret the signal. Xing Li and colleagues, reporting in *Plant Communications*, identified the EAR motif-containing adaptor protein ECAP as a partner that strengthens abscisic acid (ABA) responses in Arabidopsis. ECAP promotes both production and activity of ABI5, a transcription factor central to ABA-mediated inhibition of germination.

The investigation began with mutants grown on ABA-containing media. Seeds lacking functional ECAP germinated more readily than normal plants, and their seedlings developed green cotyledons more frequently. Reintroducing ECAP restored a response similar to the normal control, while a second mutant supported the finding. Pronounced differences were absent in untreated comparisons. Thus, the evidence concerns sensitivity to ABA, not a general improvement in germination under all conditions.

Gene-expression analyses revealed substantial overlap between the programmes regulated by ECAP and ABI5. Numerous ABA-responsive genes were less strongly expressed when either regulator was disrupted, including genes associated with seed development and maturation. The shared targets included EM1 and EM6, established markers of ABI5-dependent responses. These results suggested a common regulatory pathway, although changes in transcript abundance alone could not establish direct interaction or identify every primary target.

Biochemical and cell-based experiments supplied the mechanistic evidence. ECAP physically interacted with ABI5, and their association was detected in the nucleus. Reporter assays showed that ECAP increased ABI5's capacity to activate target genes. Chromatin experiments also detected ECAP at an ABA-responsive promoter, with substantially reduced association when ABI5 was absent. These findings support recruitment through ABI5 rather than independent recognition of the same DNA sequence by ECAP, which lacks a recognised DNA-binding domain. ECAP also strengthened the pathway upstream of these targets. ABI5 expression declined in an ECAP mutant, while ECAP promoted activity of the ABI5 promoter in

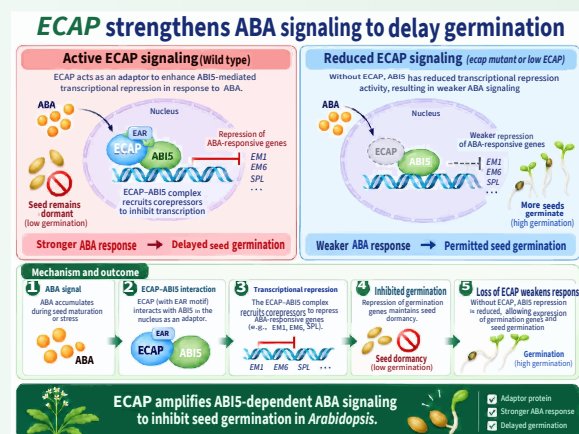


Figure 2. ECAP enhances ABI5 expression and transcriptional activity, strengthening ABA-mediated inhibition of Arabidopsis seed germination.

reporter assays and associated with several promoter regions. The protein therefore supports both ABI5 transcription and downstream transcriptional activity. However, the factor recruiting ECAP to the ABI5 promoter remains unidentified. Its EAR motif was not required for the measured ECAP-ABI5 interaction, emphasising that this motif does not define every function of the adaptor protein.

Genetic tests reinforced the relationship. ECAP overexpression increased ABA sensitivity, but this effect was lost when ABI5 was absent. Conversely, ABI5 overexpression partly corrected the reduced ABA sensitivity of an ECAP mutant. The incomplete rescue and double-mutant responses indicate that ECAP may also make ABI5-independent contributions. Together, the evidence establishes coordinated regulation without reducing the pathway to an exclusively linear mechanism.

For seed researchers, ECAP offers a target for investigating how regulatory partnerships fine-tune germination restraint. The study does not demonstrate improved crop emergence, storage performance or preharvest-sprouting resistance. Translation requires identifying comparable functions in crops and balancing stronger ABA responses against timely establishment. Its immediate contribution is a clearer account of how an adaptor protein amplifies a familiar hormonal signal, expanding the molecular framework available for understanding and manipulating seed germination.

Research source

Li, X., Zhang, J., Xu, C., Wang, L., and Yan, S. (2026). The EAR motif-containing adaptor protein ECAP enhances ABI5-mediated ABA signaling to inhibit seed germination in Arabidopsis. *Plant Communications*, 7, 101839. DOI: 10.1016/j.xplc.2026.101839

Fascinating Facts from the World of Seeds

Dr. V. Sankaran

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1 Senna - a Legume without Nodules

Senna (*Cassia angustifolia*), a legume in Fabaceae, does not form root nodules and therefore does not fix atmospheric nitrogen, although it is legume.



Senna (Cassia angustifolia)

2 *Sesbania rostrata* - a fast N fixer

Sesbania rostrata forms nodules both on roots and on the aerial stem and is known for rapid nitrogen fixation, reported at about 100 to 285 kg N/ha in 45 d.



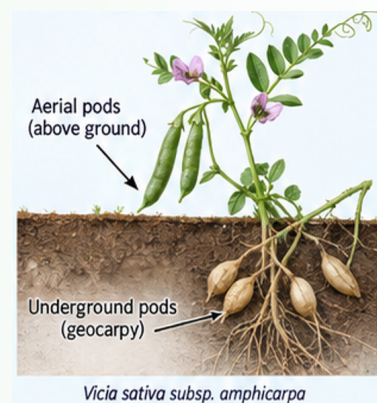
Root nodules

Aerial stem nodules

Sesbania rostrata

3 *Vicia sativa* subsp. *amphicarpa*

This vetch can produce flowers and pods both above ground and below ground, ensuring seed set under diverse conditions.



Vicia sativa subsp. *amphicarpa*

4 Candle nut tree

Seeds of candle nut tree (*Aleurites moluccanus*) are rich in oil and were traditionally used in Hawaii as a source of light.

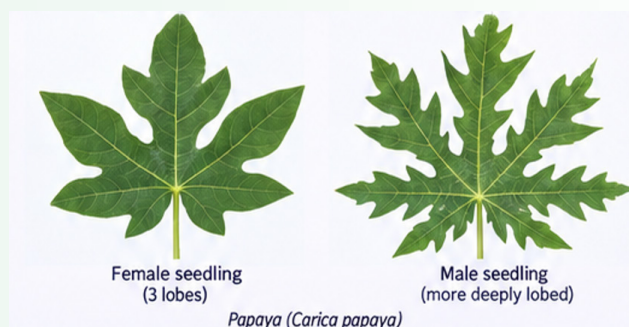


Candle nut seeds
(*Aleurites moluccanus*)

Candle nut lamp
(traditional Hawaiian use)

5 Papaya - dioecious and seedling identification

Papaya (*Carica papaya*) is dioecious, with male and female flowers on different plants. Seedlings may sometimes differ in leaf lobing; female seedling often show 3-lobed leaves and male seedlings with more deeply lobed leaves.



Female seedling
(3 lobes)

Male seedling
(more deeply lobed)

Papaya (Carica papaya)

NOTE:

All the ISST members are requested to contribute to various columns of Seed Tech News by providing information on a) Awards and Honours received; b) Upcoming trainings/ events; c) Recommendations of scientific gatherings; d) Latest research findings etc. In addition, brief technical notes may also be submitted for fast dissemination.

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