Countering False Information in Emergency Situations: Spanish Fact-Checkers on X During the 2024 DANA

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Abstract. In October 2024, a high-altitude isolated depression (DANA, for its acronym in Spanish) severely impacted Spain, with particularly devastating effects in the Valencian Community, where hundreds of people lost their lives. This climate emergency triggered the circulation of a large volume of false content that went viral through digital platforms. The main objective of this research is to characterize the hoaxes debunked by Spanish fact-checking agencies on X in relation to the DANA. Using quantitative content analysis, this study examines the posts published on X by *Newtral*, *Maldita*, EFE Verifica, and Verificat between October 29 and November 29, 2024 (N = 492). The findings show that Spanish fact-checkers verified an average of 5.96 false claims per day on X during the analysis period, covering a wide range of topics. However, content related to conspiracy theories, the alleged collapse of dams and reservoirs, and the visits of the Spanish Royal Family, Prime Minister Pedro Sánchez, and Valencian President Carlos Mazón to the affected area were especially prominent. More than 45% of the false content was created ad hoc to deliberately deceive the public, although a significant proportion involved the reuse or decontextualization of images or videos. Notably, only 31.8% of the fact-checks included references to sources, and those that did mostly cited official sources. Furthermore, the results indicate that EFE Verifica's posts achieved the greatest reach on X among the fact-checking agencies.
Keywords. Disinformation, fact-checking, emergency, X, DANA.

[ES] Desmintiendo bulos en situaciones de emergencia: el caso de los *fact-checkers* españoles en X durante la DANA de 2024

Resumen. En octubre de 2024 una Depresión Aislada en Niveles Altos (DANA) asoló España, siendo especialmente cruenta en la Comunidad Valenciana, donde cientos de personas murieron. Esta emergencia climática desató la circulación de un gran número de contenidos falsos que se viralizaron a través del entorno digital. El objetivo principal de esta investigación es caracterizar los bulos que desmintieron las agencias de verificación españolas en X sobre la DANA. Empleando la técnica del análisis de contenido cuantitativo, se analizan los mensajes publicados en X por *Newtral*, *Maldita*, EFE Verifica y Verificat entre el 29 de octubre y el 29 de noviembre de 2024 (N = 492). Los resultados muestran que los *fact-checkers* españoles verificaron una media de 5,96 contenidos falsos diarios en X durante el período de análisis, sobre temáticas muy diversas. Priman, sin embargo, aquellas relacionadas con las teorías de la conspiración, la rotura de presas y embalses, y la visita de los Reyes, Pedro Sánchez y Carlos Mazón a la zona afectada. Más del 45 % de estos contenidos fueron creados ad hoc para engañar a la ciudadanía, aunque también hay un porcentaje elevado en los que se reutilizan o descontextualizan imágenes o vídeos. Destaca también como tan solo el 31,8 % de los mensajes incluyen alguna referencia a las fuentes consultadas y, las que citan, son mayoritariamente oficiales. Además, los resultados muestran como EFE Verifica es la agencia de verificación cuyos mensajes obtienen un mayor alcance en X.
Palabras clave. Desinformación, verificación, emergencia, X, DANA.

1. Introduction

In a media environment marked by information overload and intensive use of social media, disinformation poses a growing threat to the communicative and democratic ecosystem (Wardle & Derakhshan, 2017). This phenomenon becomes particularly acute in emergency contexts, where the management of public information plays a crucial role. In situations characterized by uncertainty, the public's urgent need for up-to-date information facilitates the spread of hoaxes and unverified content, which can exacerbate the impact of the crisis and fuel social panic.

Within this framework, high-risk scenarios are especially vulnerable to the accelerated circulation of rumors, manipulated images, and false messages that spread rapidly on social media. One example is the case of the DANA (DANA is a Spanish acronym for Depresion Aislada en Niveles Altos), an extreme weather phenomenon that affected Spain in October 2024, bringing torrential rains and flooding to various regions of the country, especially the Valencian Community. The DANA caused significant material damage, fatalities, and missing persons, while also generating a high volume of misleading content on social media platforms, including false alerts and distorted political claims regarding the crisis response.

Although previous research has shown that social media platforms have become key spaces for the dissemination of disinformation, they also play a fundamental role in its debunking. Coddington, Molyneux, and Lawrence (2014) pointed out that X (formerly Twitter) is a particularly suitable platform for fact-checking. In this regard, it is one of the preferred networks for fact-checkers, followed by others such as Facebook, Instagram, YouTube (Dafonte-Gómez *et al.*, 2022), or WhatsApp channels (Tirado-García & Alonso-Muñoz, 2024). On these platforms, fact-checkers not only combat disinformation through data verification but also act as mediators between expert knowledge and the general public (Amazeen, 2020; Graves, 2016). In the case of the DANA, X hosted numerous corrective responses from Spanish fact-checking agencies, whose role became essential in a context defined by fast-moving information and the need for accuracy.

While there is extensive research on the role of fact-checkers in countering disinformation, empirical studies focusing on their real-time actions during extreme events with high media exposure remain scarce. Therefore, this study aims to analyze the role of X as a fact-checking space during emergencies. Specifically, it examines the communication strategies used by Spanish fact-checkers on this social network during the October 2024 DANA, with the goal of identifying the types of debunks, thematic focuses, and the levels of engagement that characterize their interventions. This analysis not only describes the behavior of Spanish fact-checkers in emergency situations but also assesses their capacity to influence the digital environment in contexts where verification efforts are key to mitigate informational harm and guide public decision-making.

2. State of the art

2.1. Disinformation in emergency situations

In recent years, the rise of disinformation (Casero-Ripollés *et al.*, 2023), understood as the spread of erroneous or deliberately manipulated information for profit or with the intent to cause public harm (Bennett & Livingston, 2018), alongside the decline in the credibility of traditional media (Salaverría & Cardoso, 2023), has heightened concern about the proliferation of false information (Bachmann & Valenzuela, 2023). We are currently immersed in a communicative ecosystem characterized by information disorders (Wardle & Derakhshan, 2017), which "drive the massive production and circulation of deliberately false information, harmless erroneous information, and malicious content" (Casero-Ripollés *et al.*, 2023, p. 4). This issue negatively affects the quality of democratic systems in our societies, posing a threat to their legitimacy (Bennett & Livingston, 2018).

The rise of disinformation is closely linked to technological development. Advances in Artificial Intelligence have further intensified this problem by facilitating the mass creation and dissemination of deepfakes—videos and audio recordings that simulate false images and sounds with a high degree of realism (Casero-Ripollés, 2024). As Fernández-Castrillo and Magallón-Rosa (2023) point out, the interaction between AI and disinformation is especially critical in contexts of high informational and emotional sensitivity, where phenomena such as outrage culture or clickbait can significantly amplify harmful effects. These are situations involving natural or human threats that affect decision-making, mitigation, and communication processes (Slovic & Weber, 2002). Paradigmatic examples of this dynamic were observed during the COVID-19 health crisis in 2020 (León *et al.*, 2022; Zunino, 2021) and the war between Russia and Ukraine in 2022, where numerous hoaxes were disseminated for both economic and political purposes (Fernández-Castrillo & Magallón-Rosa, 2023). Electoral processes, such as the 2024 European Parliament elections, are also moments marked by the spread of misleading content aimed at delegitimizing democratic institutions (Casero-Ripollés *et al.*, 2025).

In such scenarios, characterised by uncertainty and information overload, fear and confusion create fertile ground for conspiracy theories to gain prominence (Casero-Ripollés *et al.*, 2024; Farinelli, 2021). These narratives offer simple explanations for complex phenomena by attributing their causes to deliberate actions by elites (Douglas *et al.*, 2019). Recent studies indicate that these discourses especially proliferate on platforms like Telegram, where like-minded communities share and reinforce false content in a coordinated manner (Russo *et al.*, 2023).

The spread of conspiracy theories in emergency situations not only undermines public trust in institutions but can also lead individuals to accept simplified and emotionally charged narratives even when such narratives lack empirical support or verifiable evidence (Pennycook & Rand, 2020). In other words, they offer easy solutions to highly complex problems, simplifying reality, exaggerating threats, and presenting a black-and-white worldview (Marchlewska *et al.*, 2018). Conspiracy theories may also incite dange-

rous collective behavior that contradicts official and scientific recommendations (Casero-Ripollés *et al.*, 2024; Farinelli, 2021), as occurred, for instance, with the COVID-19 pandemic and the anti-vaccine movement (Romer & Jamieson, 2020).

Ultimately, the saturation of information in the digital environment contributes to disinformation, largely due to the role of bots in creating information bubbles and polluting the informational ecosystem. As a result, fact-checking has gained increasing relevance in the contemporary media landscape, becoming a key tool in the fight against false content and conspiracy narratives (Graves & Cherubini, 2016; Guallar *et al.*, 2020).

2.2. Social Media as a Tool for Fact-Checking Agencies

Fact-checking is defined as "the systematized practice of verifying statements made by public figures and institutions and publishing the results of the process" (Walter *et al.*, 2020, p. 73). Although it has traditionally been associated with the political sphere, its use has progressively expanded to include all types of content disseminated in the public domain. Its main objective is to guide users on the reliability of information in the digital environment (Brandtzaeg *et al.*, 2018) and to strengthen the truthfulness of public discourse (Humprecht, 2020). In this sense, fact-checking acts as a counterforce to disinformation in the information ecosystem (Jiang & Wilson, 2018).

Fact-checkers are independent and non-partisan entities. In order to ensure the quality of their work, the Poynter Institute created the International Fact-Checking Network (IFCN) in 2015, a network that sets out a rigorous code of principles focused on transparency. This code requires fact-checkers to adhere to clear standards regarding their sources, funding, and organizational structure. In Spain, five journalistic organizations are currently affiliated with the IFCN: *Maldita*, *Newtral*, and *Verificat*, as well as two entities associated with national media outlets: EFE Verifica and Verifica RTVE.

The social dimension is a key component of the fact-checkers' mission, whose effectiveness largely depends on their ability to reach audiences exposed to disinformation (Humprecht, 2020). In line with this goal, fact-checking agencies have incorporated social media into their dissemination strategies—not only due to its low operational cost, but also for its potential to encourage public engagement with verified content (Brandtzaeg *et al.*, 2018). These platforms allow fact-checkers to amplify the reach of their work within the same environments where disinformation spreads most rapidly (Margolin *et al.*, 2018; Sidorenko-Bautista *et al.*, 2021).

Within this context, in addition to their official websites and Facebook, X has become one of the most widely used communication channels for fact-checkers to disseminate their content (Míguez-González *et al.*, 2023). Indeed, several studies have already analyzed the strategies used to debunk rumors, the types of verifications conducted, the topics addressed on this platform, and the level of engagement and interaction achieved (Morejón-Llamas *et al.*, 2022; Pérez-Curiel & Velasco-Molpeceres, 2021; Ramon-Vegas *et al.*, 2020). These studies highlight,

among other aspects, the frequent use of hyperlinks and the limited presence of multimedia resources —particularly images— in their posts (Míguez-González *et al.*, 2023).

Given all of the above, X's distinctive features, such as immediacy, horizontality, and simplicity play a crucial role in the verification of information during emergency situations. These features enable the real-time dissemination of vital information at times when instant verification is essential to identify disasters, mitigate risks, and save lives (Méndez-Muros *et al.*, 2024). Due to its capacity for the immediate distribution of messages, X has become a fundamental tool in the verification process during crises, enabling faster and more effective responses in high-risk contexts.

3. Objectives and methodology

The present research aims to characterize the debunking posts about the DANA published by Spanish fact-checking agencies on X. To this end, the following specific objectives are proposed:

- SO1. Examinining the frequency of DANA-related debunking posts on the X profiles of *Newtral*, *Maldita*, EFE Verifica, and Verificat.

- SO2. Identifying the topics of the DANA-related debunking posts published on the X profiles of *Newtral*, *Maldita*, EFE Verifica, and Verificat.

- SO3. Determining the type of disinformation about the DANA verified by *Newtral*, *Maldita*, EFE Verifica, and Verificat on their X profiles.

- SO4. Examining the structure of sources used in the DANA-related debunking posts published on the X profiles of *Newtral*, *Maldita*, EFE Verifica, and Verificat.

- SO5. Analyzing the type of interaction in the DANA-related debunking posts published on the X profiles of *Newtral*, *Maldita*, EFE Verifica, and Verificat.

- SO6. Studying the reactions to the DANA-related debunking posts published on the X profiles of *Newtral*, *Maldita*, EFE Verifica, and Verificat.

3.1. Study design

The methodology used in this research is quantitative content analysis, which enables the objective and systematic examination of message content (Bardin, 1996). For this purpose, messages published by *Newtral*, *Maldita*, EFE Verifica, and Verificat about the DANA on X during the month following the catastrophe were selected. The sample was chosen for two main reasons. First, all four Spanish fact-checking agencies are affiliated with the International Fact-Checking Network (IFCN), a unit of the Poynter Institute whose goal is to bring together journalists dedicated to fact-checking at the international level. Second, the October 29, 2024 DANA represented an unprecedented environmental disaster in Spain, not

only in terms of material damage but also personal loss, as it resulted in 227 deaths. The total sample consists of 492 posts.

The analytical model used includes six variables. The first refers to the date of publication of the debunking posts. The second, related to the themes of disinformation, includes the following 18 categories: 1) Dams, reservoirs, and lakes; 2) Political responsibility, competencies, and DANA management; 3) Victims; 4) Humanitarian aid; 5) Donations (come from civil society); 6) Volunteers; 7) Visit by the Spanish Royal Family, Carlos Mazón, and Pedro Sánchez; 8) Financial aid (come from the institutional level); 9) AEMET (State Meteorological Agency of Spain); 10) CHJ (Júcar River Basin Authority); 11) Epidemics; 12) Conspiracy theories; 13) Supplies; 14) Civil protection; 15) Climate change; 16) Infrastructure; 17) Rainfall; and 18) Other.

With regard to the type of disinformation, the third variable, the classification by Wardle and Derakhshan (2017) is applied, which distinguishes the following categories: 1) Exaggeration based on a truthful fact or data; 2) Decontextualization of facts, statements, photos, or videos; 3) Fabricated content-based deception; 4) Manipulated images or videos; 5) Reuse of old or out-of-context images or videos; 6) AI-generated content; and 7) Other.

To examine the structure of sources, the fourth variable, the presence or absence of sources in the X post is analyzed, along with the nature of the source, distinguishing among: 1) Official sources; 2) Professional sources; and 3) Alternative sources.

The fifth variable, interaction, analyzes the presence of mentions, hashtags, multimedia elements, and hyperlinks in the posts. Finally, in order to analyze the reactions, the number of likes, reposts, replies, and views each post received is taken into account.

The messages were downloaded using the TwExportly tool which, in its paid version, allows downloading of messages, retweets and responses from selected X profiles. Data analysis was performed using the SPSS statistical program (v.29).

4. Results

4.1. Frequency of DANA-Related Debunking Posts on X by Spanish Fact-Checking Agencies

During the period analyzed (from October 29 to November 29, 2024), Spanish fact-checking agencies published a total of 492 posts related to the DANA on X. Among all these posts, 36.18% debunked false content, while 58.54% were used to provide information, 2.85% offered advice, and 2.44% summarized relevant information about the event.

Focusing specifically on the debunking posts related to the DANA published on X by the Spanish fact-checking agencies during the examined period, an average of 5.93 pieces of false content per day was identified, an exceptionally high figure, considering that on half of the analyzed days, six or more debunking posts were published. In this regard, it is important to highlight that the two weeks following the catastrophe were particularly critical in terms of the production and dissemination of false content.

Gráfico 1. Frequency of DANA-Related Debunking Posts by Spanish Fact-Checking Agencies.
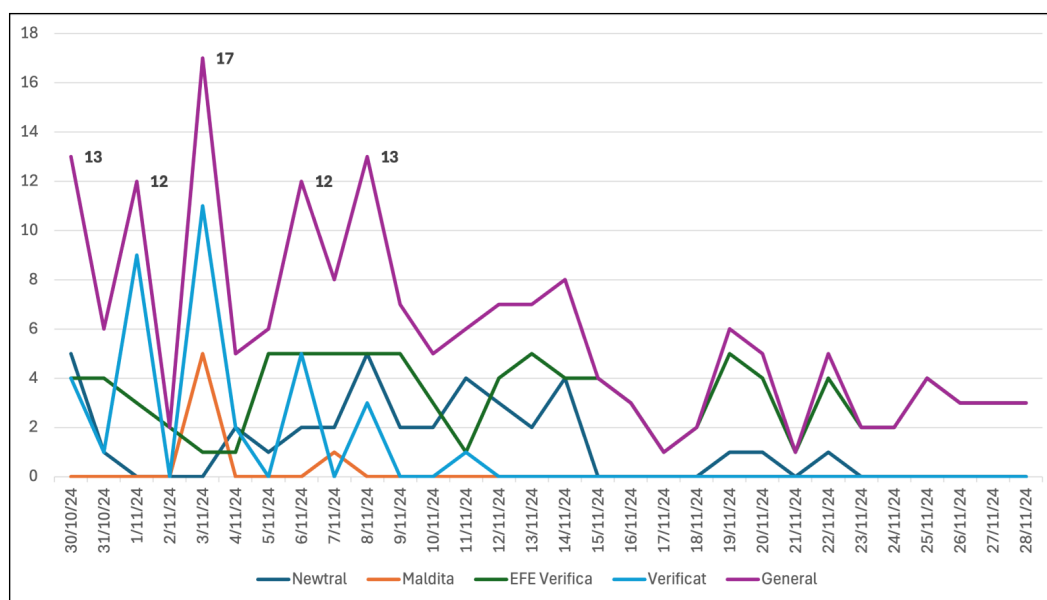
Source: Own production.

Among the peaks in activity (Figure 1), five specific days stand out (October 30 and November 1, 3, 6, and 8), on which between 12 and 17 debunking posts were published each day, some of them coinciding with significant events. For instance, on October 30, the day after the DANA, Spanish fact-checking agencies debunked 13 hoaxes (Figure 1), mainly related to the connection between climate change and the DANA, and claims that other dams and reservoirs in the Va-

lencian Community had been affected by the storm, putting local residents at risk, while authorities had supposedly remained silent.

On November 1, with 12 verifications, debunks began to appear regarding political responsibility and the management of the DANA (Figure 1). Specifically, the debunked hoaxes claimed that the Spanish government had refused to send aid to the Valencian Community because it was governed by a party from

the political opposition, and that AEMET, as a government agency, had not issued warnings for the same political reasons.

Another event that triggered a surge in disinformation was the visit of the Spanish Royal Family, Carlos Mazón (President of the Generalitat Valenciana), and Pedro Sánchez (Prime Minister) to Paiporta, one of the towns affected by the DANA, on November 3. The visit was tense due to public discontent, and some incidents occurred. This led to a wave of disinformation, particularly hoaxes linking some of the residents of Paiporta to far-right groups. In fact, this was the day with the highest number of debunking posts, reaching 17 false claims corrected by the fact-checking agencies (Figure 1).

Finally, the peaks on November 6 and 8 (with 12 and 13 debunking posts, respectively) correspond to the circulation of numerous conspiracy theories, such as the claim that the deaths at the Bonaire parking lot had been covered up, or that humanitarian organizations like the Red Cross and Caritas

were keeping donations instead of distributing them among the victims (Figure 1).

4.2. What Types of Content Did Spanish Fact-Checking Agencies Debunk About the DANA on X?

An analysis of the themes addressed in the DANA-related debunking posts published on X by the four Spanish fact-checking agencies reveals several noteworthy findings. Overall, three main topics dominated the false content circulating about the DANA (Table 1): conspiracy theories (17.92%), issues related to dams, reservoirs, and lakes (16.76%), and the visit of the Spanish Royal Family, Carlos Mazón, and Pedro Sánchez to the areas affected by the DANA (11.56%). These three issues generated a large volume of information on social media, especially on X, where a significant number of false claims circulated in the days following the DANA and continued to appear throughout much of the analyzed period.

Table 1. Topics of DANA-Related Debunking Posts on X (%).

Topic	Newtral	Maldita	EFE Verifica	Verificat	General
Dams, reservoirs, and lakes	7.89	-	23.47	8.33	16.76
Political responsibility, competencies, and DANA management	7.89	-	3.06	8.33	5.20
Victims	10.53	16.67	12.24	-	9.25
Humanitarian aid	7.89	-	4.08	-	4.05
Donations	-	-	8.16	-	4.62
Volunteers	2.63	16.67	-	-	0.58
Visit by the Spanish Royal Family, Carlos Mazón, and Pedro Sánchez	7.89	16.67	10.26	16.67	11.56
Financial aid	5.26	-	3.06	-	2.89
AEMET (State Meteorological Agency of Spain)	5.26	-	2.04	25.00	7.51
CHJ (Júcar River Basin Authority)	-	-	4.08	-	2.31
Epidemics	-	-	-	5.56	1.16
Conspiracy theories;	26.32	50.00	15.31	16.67	17.92
Supplies	2.63	-	2.04	-	1.73
Civil protection	7.89	-	6.12	-	5.20
Climate change	-	-	-	11.11	2.31
Infrastructure	2.63	-	-	-	0.58
Rainfall	2.63	-	4.08	-	2.89
Other	2.63	-	2.04	8.33	3.47
Total	100	100	100	100	100

Source: Own production.

When analyzing the data by fact-checking agency, some notable differences emerge. *Newtral* debunked false content on a wide range of topics on X (Table 1). However, the most prominent were de-

bunks related to conspiracy theories (26.32%), most of which focused on allegations that the Spanish government was hiding bodies found in the parking lot of the Bonaire shopping center in Aldaia. Despite official statements from authorities confirming that no deceased individuals had been found after inspection, these hoaxes persisted. In response, *Newtral* repeatedly published the same fact-check, citing official sources such as the UME (Military Emergency Unit) and the government. Relatedly, the second most frequent topic verified by *Newtral* was victims (10.53%), in which the agency refuted hoaxes that falsely inflated the number of deaths by alleging that the government intentionally omitted bodies, such as those supposedly found at the Bonaire shopping center, from the official death toll.

Maldita, for its part, dedicated half of its debunking posts on X during the analysis period to conspiracy theories (50%), (Table 1). As with *Newtral*, these centered on the alleged deaths at the Bonaire parking lot and supposed government cover-ups to prevent this information from becoming public. Maldita also verified content related to the visit by the Spanish Royal Family, Carlos Mazón, and Pedro Sánchez to Paiporta (Table 1). Specifically, it debunked several posts circulating on social media showing a video of the visit that claimed Pedro Sánchez had been hit by a stick. This claim was even picked up by several media outlets. However, after analyzing the footage, Maldita demonstrated that the object did not hit the Prime Minister directly but rather struck the person standing next to him.

EFE Verifica adopted a strategy similar to that of *Newtral* and also addressed a wide variety of topics in its debunking posts (Table 1), though it placed particular emphasis on issues related to dams, reservoirs, and lakes (23.47%). The debunked content in this category consisted of hoaxes claiming that various dams and reservoirs had been damaged or

were at risk of collapse due to the storm, allegedly threatening nearby communities. However, none of these claims were true. Additionally, *EFE Verifica* recorded a high percentage of debunks related to conspiracy theories (15.31%), victims (12.24%), and the visit of the Spanish Royal Family, Carlos Mazón, and Pedro Sánchez (10.26%) to the affected areas.

Finally, Verificat focused its activity on a smaller number of topics, particularly on content related to AEMET (State Meteorological Agency of Spain) (25%). Most of the false claims in this category alleged that the agency's radar system failed, which supposedly caused it not to detect the DANA's presence in the Valencian region. Some messages also claimed that Météo-France, the French meteorological agency, had predicted the phenomenon with greater accuracy than AEMET. However, Verificat debunked these claims, confirming that the French agency had not published any relevant information prior to the event.

Regardless of the topic of the debunking posts, it is generally observed that Spanish fact-checking agencies rarely cite their sources in the verifications they publish on X regarding the DANA, with sources being referenced in only 31.8% of the posts. This percentage varies slightly depending on the agency: *Newtral* includes source references in 21.1% of its debunks, EFE Verifica in 38.8%, and Verificat in 25%. This does not necessarily imply that the sources were not consulted during the verification process, but rather that they were not mentioned explicitly in the posts on X.

When analyzing the X posts that do include references to sources (Table 2), official sources dominate (83.63%) compared to alternative sources (14.55%). In other words, the agencies tend to rely more on governmental or public institutions whose social authority is broadly recognized, rather than on expert sources.

Table 2. Nature of Sources Cited in DANA-Related Debunking Posts on X (%).

Nature of the source	*Newtral*	*Maldita*	EFE Verifica	Verificat	General
Official sources	87.50	-	97.34	22.22	83.63
Professional sources	12.50	-	-	-	1.82
Alternative sources	-	-	2.63	77.78	14.55
Total	100	-	100	100	100

Source: Own elaboration.

The case of Verificat is particularly noteworthy, as the agency places a strong emphasis on consulting subject-matter experts (77.78%), such as university professors in the fields of physics or meteorology. Similarly, *Newtral* often turns to professional sources, including journalists or media outlets covering information related to the DANA. Finally, regarding the type of disinformation debunked by Spanish

fact-checking agencies, we observe that, in general, the majority refer to entirely fabricated content (45.86%) that bears no relation to reality and is intentionally created to deceive users (Table 3). In second place are debunks of content involving the decontextualization of facts or images (25.97%), followed by posts that reuse content from other locations or events (17.13%).

Table 3. Type of Disinformation Debunked About the DANA on X (%).

Type of Disinformation	Newtral	Maldita	EFE Verifica	Verificat	General
Exaggeration based on a truthful fact or data	5.26	-	6.12	13.89	7.73
Decontextualization of facts, statements, photos, or videos	21.05	20	24.49	36.1	25.97
Fabricated content-based deception	44.74	80	42.86	50.00	45.86
Manipulated images or videos	2.63	-	3.06	-	2.21
Reuse of old or out-of-context images or videos	21.05	-	23.47	-	17.13
AI-generated content	2.63	-	-	-	0.55
Other	2.63	-	-	-	0.55
Total	100	100	100	100	100

Source: Own production.

The trends observed across the four Spanish fact-checking agencies are largely similar, with only some variations in percentages (Table 3). In terms of fabricated content, most cases are related to conspiracy theories, such as the alleged deaths in the parking lot of the Bonaire shopping center. Meanwhile, the decontextualization of facts and the reuse of images or videos are particularly associated with rumors about the collapse of dams and reservoirs. In this regard, it is noteworthy that only *Newtral* verified content was generated by Artificial Intelligence (2.63%), although the percentage is very low.

4.3. Use of Interaction and Reactions Generated by DANA-Related Debunking Posts Published by Spanish Fact-Checking Agencies on X

One of the multiple affordances of X is the ability to foster interaction through the use of features such as mentions, hashtags, or multimedia elements.

The use of such resources enables a bidirectional communication dynamic between fact-checking agencies and other users on the platform. In general terms, the use of mentions (16.2%) and hashtags (2.3%) in the debunking posts published by Spanish fact-checking agencies on X is very limited (Table 4). In this regard, *Maldita* and EFE Verifica do not use these features in any of their debunks. In contrast, *Newtral* and Verificat do make use of them. For *Newtral*, the use of hashtags (7.9%) slightly surpasses the use of mentions (5.3%). A single hashtag—#FACT-CHECK—is used repeatedly across various posts to signal the newsroom's verification efforts. Mentions refer to a journalist from the agency (@andreagonzg1) and to the television program (@DebatAlRojoVivo) in which she participates to discuss the disinformation surrounding the DANA. Verificat, on the other hand, frequently uses mentions to refer to entities such as AEMET or the Spanish government, or to cite expert statements included in their debunking posts.

Table 4. Type of Interaction Generated by DANA-Related Debunking Posts on X (%).

Type of Interaction		Newtral	Maldita	EFE Verifica	Verificat	General
Mentions	Yes	5.3	-	-	75	16.2
	No	94.7	100	100	25	83.8
Hashtags	Yes	7.9	-	-	2.8	2.3
	No	92.1	100	100	97.2	97.7
Multimedia elements	Yes	100	100	100	36.1	86.7
	No	-	-	-	63.9	13.3
Number of multimedia elements	0	-	-	-	63.9	13.3
	1	7.9	-	-	33.3	8.7
	2	92.1	100	100	2.8	78.0
Type of multimedia element	Photo	92.1	100	100	5.6	78.6
	Link	100	100	100	33.4	86.1
Where direct the link?	Own website	100	100	100	75.1	97.9
	Externa website	-	-	-	8.3	0.7
	External Social Media Account	-	-	-	8.3	0.7
	WhatsApp	-	-	-	8.3	0.7

Source: Own production.

The use of multimedia elements to accompany posts on X is very common (Table 4), particularly in the cases of *Newtral*, *Maldita*, and EFE Verifica, all of which include at least one multimedia element in every post. In this regard, all their posts contain a hyperlink to their website, where users can access the full verification. Additionally, with the exception of *Newtral*, they also consistently include a related image. The opposite case is observed with Verificat, where 63.9% of the debunking posts published on X consist only of text, and when multimedia is used, it generally involves a single element (Table 4). Notably, *Verificat* uses links (33.4%) more frequently than images (5.6%). It is striking that none of the analyzed debunking posts include video or other more interactive media resources.

Table 5. User Reactions to DANA-Related Debunking Posts on X (M = Media and SD = Standard Deviation).

Type of Reaction	*Newtral*	*Maldita*	EFE Verifica	Verificat	General
Number of likes	M = 59.47 (SD = 300.24)	M = 21.16 (SD = 16.33)	M = 90.77 (SD = 490.46)	M = 3.94 (SD = 4.00)	M = 65.60 (SD = 395.25)
RT	M = 37.56 (SD = 184.15)	M = 12.50 (SD = 10.36)	M = 68.65 (SD = 365.53)	M = 1.11 (SD = 2.08)	M = 47.55 (SD = 288.75)
Replies	M = 4.58 (SD = 17.43)	M = 2.50 (SD = 1.97)	M = 5.68 (SD = 35.33)	M = 0.91 (SD = 0.76)	M = 4.45 (SD = 27.81)
Views	M = 7847.47 (SD = 15502.75)	M = 6530.33 (SD = 3828.74)	M = 8802.33 (SD = 36634.35)	M = 957.00 (SD = 1055.01)	M = 6989.65 (SD = 28613.38)

Source: Own production.

Finally, regarding user reactions, the verifications published by EFE Verifica were the most widely shared, receiving the highest average number of likes (M = 90.77; SD = 490.46) and retweets (M = 68.65; SD = 365.53) compared to the other agencies (Table 5). It also recorded the highest average number of replies (M = 5.68; SD = 35.33).

When analyzing views and therefore the reach of the verifications published by the four Spanish fact-checking agencies (Table 5) it is observed that EFE Verifica and *Newtral* show the highest average reach, with approximately 8,800 and 7,800 views, respectively, followed by *Maldita*, with an average of 6,530 views. The most striking case is that of Verificat, which, being a much smaller fact-checking agency compared to its competitors, shows significantly lower figures in terms of user reactions and reach.

5. Discussion y conclusions

In emergency situations, people need to know what is happening in real time, which makes platforms like X essential sources of information. During moments of chaos and confusion, the circulation of false content increases exponentially as was the case during the COVID-19 pandemic (León *et al.*, 2022; Zunino, 2021) even reaching the point of endangering lives (Farinelli, 2021; Romer & Jamieson, 2020).

This research analyzes the communication strategies employed by Spanish fact-checking agencies on X during the October 2024 DANA, with the aim of characterizing the disinformation they debunked in relation to this extreme weather event, which resulted in the deaths of more than 200 people in Spain. The findings of this study allow us to draw several relevant conclusions.

First, the data shows that the four analyzed fact-checking agencies published a high volume of content related to the DANA on X (Objective 1). Specifically, in the month following the event, fact-checkers published 492 posts on this platform, underscoring its importance. However, more than half of the posts aimed to provide information, and only 36% debunked false content. This is a revealing finding, as it shows that despite their primary role being verifica-

tion (Guallar *et al.*, 2020; Tirado-García & Alonso-Muñoz, 2024), the agencies also assume an informative role similar to that of traditional media, publishing a large number of posts intended to explain issues that could later give rise to misleading content.

Second, the data shows that Spanish fact-checkers debunked an average of almost six false claims per day on X, pointing to a high level of disinformation about the DANA during the analyzed period. Two patterns emerge: first, the 15 days following the event were critical in terms of disinformation production and dissemination; second, spikes in activity coincided with specific moments such as the visit of the Spanish Royal Family, Pedro Sánchez, and Carlos Mazón to Paiporta, one of the affected towns. These results show that although disinformation was sustained throughout the month, it intensified at key moments. This aligns with findings from other events, such as the 2024 European Parliament elections, where disinformation followed a continuous life cycle with peaks around specific milestones (Casero-Ripollés *et al.*, 2025).

Third, the analysis of the themes of false content (Objective 2) reveals different strategic approaches among the agencies. While *Maldita* and Verificat focused on a narrow set of topics, *Newtral* and EFE Verifica addressed a broader range of issues. Nevertheless, three topics dominated nearly half of all debunks: conspiracy theories, the status of dams and reservoirs, and the high-profile visits to affected areas. Consistent with previous studies (Casero-Ripollés *et al.*, 2024; Pennycook & Rand, 2020), conspiracy-related content though lacking empirical basis simplifies narratives and exploits emotional appeal to foster distrust in institutions and, in this case, in public safety systems. Thus, in a context marked by chaos and uncertainty and with the public shocked by an unprecedented situation, the propagation of false content is much easier because people want to find an explanation for what happened. Likewise, as occurred with COVID-19 (Taboada-Villamarín *et al.*, 2024), in the case of the DANA some conspiracy theories served as a gateway to others, which made their propagation easier and gave meaning to the disinformation story.

Fourth, regarding the type of disinformation (Objective 3), entirely fabricated content accounts for nearly half of the falsehoods debunked on X. Most of these were tied to conspiracy narratives, such as those about deaths at the Bonaire shopping center. Also common were reused and/or decontextualized statements, images, or videos, often involving footage from unrelated events used to induce panic. These findings confirm earlier research, which also identified these three formats as the most prevalent types of disinformation (Tirado-García & Alonso-Muñoz, 2024; Wardle & Derakhshan, 2017). Interestingly, in the case of the DANA, AI-generated disinformation was virtually absent, a trend also noted in other events (Casero-Ripollés *et al.*, 2025), which contrasts with the claims of Fernández-Castrillo and Magallón-Rosa (2023) that AI-disinformation interplay is especially critical in emergency contexts.

Fifth, as with WhatsApp channels (Tirado-García & Alonso-Muñoz, 2024), fact-checking agencies on X rarely include source references in their posts (Objective 4), with only one-third of posts citing any source. Our data also reveals three distinct strategies: *Maldita* does not reference any sources in its X posts; *Newtral* and EFE Verifica prioritize official government sources whose authority is socially recognized; and *Verificat* focuses on expert sources, such as scientists, emphasizing professional expertise over institutional authority.

Sixth, the study shows that interaction strategies such as mentions and hashtags are seldom used on X (Objective 5), with the notable exception of Verificat, which frequently uses mentions especially when referencing expert sources. Verificat also stands out in its limited use of multimedia, posting images or links in only one-third of its posts, whereas the other agencies consistently use at least one such element. Thus, not only do fact-checkers generally fail to foster interaction on X unlike platforms such as TikTok (Sidorenko-Bautista *et al.*, 2021) but Verificat still has room to better exploit the multimedia potential of the platform.

Finally, in terms of user reactions (Objective 6), EFE Verifica and *Newtral* achieved the greatest reach, with their posts averaging around 8,000 views. This suggests that the DANA had a significant impact on Spanish society and that a large number of people turned to X both to stay informed and to verify which content was false. In this sense, the fact that this type of publications have a high volume of visualizations implies that there is a high volume of people who are exposed to the verification and, therefore, that they are aware of the disinformation circulating in the digital environment about a complex issue such as the DANA.

Despite its descriptive nature, this study allows for a clear characterization of the content shared by Spanish fact-checking agencies about the DANA on X, a complex and tragic event that triggered a high volume of disinformation circulating in the digital sphere.

6. Authors' contribution

Conceptualization	Ideas; formulation or evolution of overarching research goals and aims.	Authors 1 and 2
Data curacition	Management activities to annotate (produce metadata), scrub data and maintain research data (including *software* code, where it is necessary for interpreting the data itself) for initial use and later re-use.	Authors 1 and 2
Formal analysis	Application of statistical, mathematical, computational, or other formal techniques to analyse or synthesize study data.	Authors 1 and 2
Funding acquisition	Acquisition of the financial support for the project leading to this publication.	Authors 1 and 2
Investigation	Conducting a research and investigation process, specifically performing the experiments, or data/evidence collection.	Authors 1 and 2
Methodology	Development or design of methodology; creation of models.	Authors 1 and 2
Project administration	Management and coordination responsibility for the research activity planning and execution.	Authors 1 and 2
Resources	Provision of study materials, reagents, materials, patients, laboratory samples, animals, instrumentation, computing resources, or other analysis tools.	Authors 1 and 2
Software	Programming, *software* development; designing computer programs; implementation of the computer code and supporting algorithms; testing of existing code components.	Authors 1 and 2
Supervision	Oversight and leadership responsibility for the research activity planning and execution, including mentorship external to the core team.	Authors 1 and 2
Validation	Verification, whether as a part of the activity or separate, of the overall replication/reproducibility of results/experiments and other research outputs.	Authors 1 and 2
Visualization	Preparation, creation and/or presentation of the published work, specifically visualization/data presentation.	Authors 1 and 2
Writing / original draft	Preparation, creation and/or presentation of the published work, specifically writing the initial draft (including substantive translation).	Authors 1 and 2
Writing / review & editing	Preparation, creation and/or presentation of the published work by those from the original research group, specifically critical review, commentary or revision –including pre- or post-publication stages.	Authors 1 and 2

7. Statement on the use of artificial intelligence in the preparation of this article

No artificial intelligence tools have been used in this article.

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